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# SPACE RAPTURE: Extraterrestrial Millennialism and the Cultural Construction of Space Colonization

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# SPACE RAPTURE: Extraterrestrial Millennialism and the Cultural Construction of Space Colonization

**by**

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# Dedication

For Loring McMillen (1906-1991)

And for those who, like him, seek only to live deeply and richly on the Earth.

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# SPACE RAPTURE: Extraterrestrial Millennialism and the Cultural Construction of Space Colonization

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The dream of space colonization possesses deep roots in the Christian apocalyptic fantasy of the Rapture of the elect to occur prior to the return of Christ. Space colonization, like its predecessor ascension fantasy, the Rapture, has always involved a tension between the liberation of a holy vanguard and the imminent destruction of the Earth. With the rise of modern technology, rocketry and space travel became, for fundamentalist Christians and technological determinists alike, the manmade tools and signs of an imminent apocalypse. In this dissertation, the 1970s space colonization proposal of Princeton physicist Gerard O'Neill is offered as a case study of these millennial roots of the spacebound dream. O'Neill's colonies, offered as a way to avoid an irrevocable time of Earthly tribulation, were touted as the means of depopulating the Earth and ending terrestrial conflict. O'Neill's dreams for rocketry were no different than the dreams of those men who pioneered rocketry before him, although earlier rocketeers and space enthusiasts held more explicitly Christian-inspired apocalyptic beliefs concerning the fate of the Earth and the destiny of humanity. In addition to examining

O'Neill's colonial fantasy, this dissertation analyzes the religious and philosophical beliefs of the rocketeers to show how each of them was deeply influenced by apocalypse and Rapture fantasy. While O'Neill's plan resembled earlier space colonization and Rapture imaginings, it also incorporated the more terrestrially benevolent dreams of the burgeoning environmental movement of the era. In attempting to unite the Space Age with a newly powerful "Earth Age," O'Neill sought to resurrect the dream of space colonization for a new generation. However, O'Neill failed in this attempt. Instead of seeing humanity's future in the stars, off of a doomed Earth, many in Western culture began in the late 1960s to imagine human destiny within a long and peaceful future on Earth. This perspective came about, paradoxically, as a result of perhaps the most epochal achievement of the space race: the first photographs of the planet from the distance of the moon.

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# INTRODUCTION

The theme of total planetary destruction appears repeatedly throughout American fiction, film, and culture. In one of the first comic book panels featuring the nearly omnipotent Superman, a rocket hurtles out from Krypton, a planet in the throes of destruction. "Just before the doomed planet, Krypton, exploded to fragments," the caption below reads, "a scientist placed his infant son within an experimental rocket ship, launching it toward Earth!" Superman is the only surviving Kryptonian, and on Earth, his mental and physical powers dominate those of mortals. He is the only escapee of a technologically advanced planet, unable to prevent the immolation of Krypton by its approaching red sun.

In *Star Wars*, Darth Vader holds the white-robed Princess Leia captive, and threatens to destroy her blue-green home planet of Alderaan if she does not divulge where in the galaxy the rebel base is located. She provides false information in order to save her people, but Darth Vader and his minions decide to destroy Alderaan anyway. In the George Lucas film, a beam shoots out from the Death Star, a manmade space station, and Alderaan, in the blink of an eye, explodes into asteroids, killing its many millions of inhabitants. Leia is one of only a handful of survivors of the destruction of the earthlike Alderaan, and she becomes a pure and regal symbol of a vanished planet.

These neo-mythic images of planetary and Earthly cataclysm, derived from arguably the two most important and popular science fiction tales in American history, possess many elements in common, and are hardly the only two examples of their type. A lone, almost supernaturally beautiful, virtuous or powerful individual survives the total destruction of his/her world by the luck or fortune of being off the surface of the planet in its last hour. While these are images from the pages and frames of science fiction, they

are examples of a deeper belief matrix within Western culture. The Superman and *Star Wars* examples are merely inversions of a more prevalent fear concerning the fragility of human habitation on the Earth and the possible freedom from such fragility by leaving the planet for the freedom of interplanetary space. The technology of spaceflight itself was seen by many of its first developers and inventors as a possible method of escaping the Earth before its annihilation, whether that annihilation be the agent of asteroids, plague, or manmade war. Krypton and Alderaan are merely allegorical stand-ins for the Earth.

The ascension of a highly developed human specimen off of the planet is not unique to the characters of Princess Leia and Superman and also appears in non-fictional futuristic extrapolations of the impact of spaceflight. J.D. Bernal, a world-renowned crystallographer and philosopher of science, in a 1929 book entitled *The World, the Flesh and the Devil*, predicted the future split of humanity into an earthbound and spacebound contingent, even going so far as to predict the bifurcation of humanity into two different species. Those above – the Supermans and Princess Leias -- Bernal believed, would lord above those below as gods. The trajectory of science, surmised Bernal, would result in the development of an “aristocracy of scientific intelligence,” which would seek to separate itself from the more humanistic and Earthbound forms of humanity. These cosmically oriented "new" humans, which would be comprised, in Bernal's estimation, of various scientists and technocrats totaling approximately 10% of the world's population, would bring science "to the stars." The prospects for that portion of humanity left behind would be a bit dim. Those left behind would include the most stupid and stubborn portions of the world’s peoples. “From one point of view the scientists would emerge as a new species and leave humanity behind; from another, humanity - the humanity that counts - might seem to change *en bloc*, leaving behind in a relatively primitive state those

too stupid or too stubborn to change," wrote Bernal. Those left behind on would most likely, according to Bernal, go extinct at the hands of their wise, intelligent, and arisen brethren, or, at the very least, become the denizens of a planetary zoo kept only for the use of science and amusement.

> [T]here may not be room for both types in the same world and the old mechanism of extinction will come into play. The better organized beings will be obliged in self-defense to reduce the numbers of the others, until they are no longer seriously inconvenienced by them. If, as we may well suppose, the colonization of space will have taken place or be taking place while these changes are occurring, it may offer a very convenient solution. Mankind - the old mankind - would be left in undisputed possession of the earth, to be regarded by the inhabitants of the celestial spheres with a curious reverence. The world might, in fact, be transformed into a human zoo, a zoo so intelligently managed that its inhabitants are not aware that they are there merely for the purposes of observation and experiment.[1]

Bernal's grim view of this future split was not so grim for Bernal, who identified wholly with the skybound scientific elite. Bernal's vision was not of an Earth about to be destroyed, but an Earth about to be abandoned, and then its peoples perhaps destroyed. However, the difference is a matter of type, not of essence.

Bernal's futuristic extrapolations were not his own idiosyncracy. Many proponents of spaceflight and many of those who worked on the American, Russian, and German rocketry and space programs provided a similarly noble justification for their work on the apocalyptic weaponry of nuclear-armed rockets. The future split of humanity into an earthbound and spacebound species also runs throughout the prognostications of rocketeers and spaceflight enthusiasts with the earthbound contingent and the Earth itself often characterized as stupid, inferior, brutish, warlike, and even evil. The spacebound elite, able to watch over the entire Earth in the position of technocrat Gods, are typically characterized as virtuous, super-intelligent, cultured, peaceful, and even holy.

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[1] J.D. Bernal. *The World, the Flesh and the Devil: An Enquiry into the Three Enemies of the Rational Soul*. Bloomington: Indiana University Press, 1969. Second edition. pp. 79-80.

In the 1970s, the futurism of J.D. Bernal was honored by a Princeton physicist by the name of Gerard O'Neill. O'Neill admired Bernal's predictions concerning the colonization of space, and in particular, Bernal's suggestion that space colonies be constructed out of the processed materials of asteroids and the moon. Between 1969 and 1980, O'Neill was the United States' most prominent and popular advocate for immediate full-scale space colonization. He began a small, but influential, social movement which called for the abandonment of an environmentally ravaged planet for the social, political, and gravitational freedom of outer space. His most famous space colony design, eventually dubbed "Island One," was initially called the "Bernal sphere," and for a time in the 1970s, images of the Bernal sphere appeared in most major American newspapers and magazines with their future development almost always touted as less a question of if they would be built, but rather about when they would be built.

O'Neill, like Goddard before him, anticipated a growing host of problems facing a strictly Earthbound humanity. In the 1970s the idea that the world was quickly running out of major vital resources such as arable land, minerals and materials such as copper, gold, and oil, and drinkable water, was conventional wisdom. Books predicting doomsday – from both evangelical Christian and environmental authors – flooded American bookshelves and became some of the bestselling books of the decade. *The Limits to Growth* (1972) predicted the imminent evaporation of the Earth's resources, resulting in a crash of the capitalist system.[2] *The Population Bomb* (1968) predicted that the Earth's peoples would multiply so rapidly as to cause mass global starvation and economic collapse.[3] On the evangelical side, books such as Hal Lindsey's *The Late*

[2] Donella and Dennis L. Meadows. *The Limits to Growth*. New York: Signet, 1972.
[3] Paul Ehrlich. *The Population Bomb*. New York: Sierra Club-Ballantine, 1968 (1970).

*Great Planet Earth* (1970) predicted the imminent return of Christ, and the destruction of the Earth. In the 1970s, the apocalypse seemed imminent.[4]

O'Neill played on these fears of an imminent end to the Earth by advocating massive space colonization to relieve population, to reduce pressure on the Earth's environment, to solve the hunger and energy crises, and to halt the arms race. O'Neill's colonies attracted interest from all over the political spectrum. Self-styled American patriots found in space colonies the expansion of United States territory into space, a vertical fulfillment of the 19th century mandate for "manifest destiny." Business interests found in O'Neill's idea profitable new ventures for energy production, aerospace engineering, mineral extraction, and national defense. Artists and dreamers found in space colonies the beginnings of a new epoch in human affairs, the limitless proliferation of humanity into an extraterrestrial arena of unimaginably vast distances, unseen vistas, and communal social organization. Political philosophers and theologians imagined a new ability of mankind for societal self-determination and experimentation through the construction of "special interest" space colonies occupied by only those who chose to adhere to a particular system of belief and organization. And some environmentalists saw in space colonization the evacuation of an insatiable and unsustainable human population off of a burdened planet, into a beyond above an increasingly pollution-free sky, and the subsequent attainment of a permanent view of the ultimate ecological symbol of wholeness itself – the blue and white and beautiful Earth as previously seen by only angels and astronauts.

O'Neill believed the first colony could be constructed with fifteen years, and could quickly pay for itself through profits generated by lunar and asteroid mining, the generation and transmission of solar power in microwave form to receptors on Earth, and

[4] Hal Lindsey. *Late Great Planet Earth*. Grand Rapids, MI: Zondervan, 1970.

space tourism. The National Aeronautics and Space Administration (NASA) provided the physicist with exploratory funding for his proposal, and politicians such as California governor Jerry Brown, Arizona Congressman Morris Udall, and Georgia Congressman Newt Gingrich at various times became fervent supporters of the O'Neillian vision.

This dissertation makes the case that the space colony proposal of Gerard O'Neill in particular and the larger body of Earth exodus and Earth destruction literature in general derive directly from the central drama of the Christian apocalyptic. The imminent destruction of the Earth, the ascension of a chosen and blessed portion of humanity off of the surface just prior to its annihilation, the survival of a depraved and inferior contingent of humanity on the surface of the Earth, and the lordship of the terrestrially liberated over the Earthlings below – all of these elements are the ultimate end believed by many to be prophesied in Christian scripture, particularly in the last book of the New Testament, the Book of Revelations. The apocalyptic theme of escape from a dying planet, so common in science fiction and spaceflight advocacy literature owes its existence and mythic power to the Christian apocalyptic. Furthermore, not only does the theme of apocalypticism run throughout the writings and metaphysical beliefs of the spaceflight pioneers, but the technology of rocketry in its current form would not have occurred without the innate dualism inherent in the apocalyptic between the tensions of liberation and destruction. For the spaceflight pioneers, for O'Neill, and for Superman and Princess Leia, the destruction of the world is liberating in its ability to elevate the chosen survivors to a position of lordship in the sky, and also horrifying – in a distanced manner – in its total annihilation and finality. To build the rocket is to build a weapon capable of delivering terrifying and apocalyptic destruction anywhere on Earth, and it is also an instrument capable, some say, of ferrying humanity to the stars. These twin uses of the rocket in the 20th century emerged from millennial roots and apocalyptic dreams

deep within the cultures – both national and professional -- which developed the technology.

The translation of the drama of the Christian "rapture" – the supposed ascension of the chosen into the sky at the end of the world – to the language of outer space and spaceflight, has resulted in the creation of a new pseudoscientific belief system that exerted a significant degree of influence on American space policy, and American conceptions of outer space, throughout the 20th century. Such a belief is best described as "extraterrestrial millennialism," or for the sake of brevity, "exo-millennialism." This system of belief divests the Christian apocalyptic of nearly all of its explicitly religious language and makes the agent of ascension into heaven less God, and instead the creations of technological man. This system of belief is "extraterrestrial" in two varying grammatical senses of the word: as a noun and a verb. First, extraterrestrial millennialism often involves the cognition of a higher extraterrestrial intelligence, with powers approaching that of a god in comparison to human power, which may suddenly contact Earth and provide mankind with utopia-ushering transportation and life-extension technologies. In this sense, the belief involves "extraterrestrials" in the popular sense of the word, as a form of space life of non-Earth origin. But the word is used more prevalently in this dissertation in its adjectival form. In the broader descriptive sense of "extraterrestrial," it describes a belief system which advocates the making of the human race an extraterrestrial, or "off-Earth" species, self-sufficient and not bound to the planet. As an adjective, it also describes the sense that the belief system is extraterrestrial in outlook and cognition, and often involves a disdainful and fearful perspective in relation to the Earth.

Furthermore, this belief system is “millennial,” in that it evolved from, and retains all the major features of, the Christian millennial drama. Extraterrestrial millennialism presupposes the imminent, or inevitable, onset of an apocalyptic end to history: a secular version of the Millennium claimed by Christians to occur at or in conjunction with the Second Coming of Christ. This millennial event will be the human “breakout” into outer space and the bringing of life to the entire universe, a technologized creation of the Christian rapture. The technology of rocketry provides this “end to history,” both in its liberating power of Earth departure, and its destructive power of Earth annihilation. The dreams of the rocketeers, many borne in apocalyptic reverie, must have foreseen these twin powers in the technologies with which they were enamored. Whether evangelical Christians or Satanists or freethinking esotericists, nearly every single major founder of rocketry professed a belief in a coming apocalyptic end to history, and the role of the rocketeer in the amelioration, realization, and/or materialization of that event. While they may not have always expressed themselves in explicitly Christian terms, each of the rocketeers saw in the departure of humanity from the earth a transcendent goal of the highest order, and for many, the creation of this extraterrestrial exodus remained the major inspiration for their life’s work.

Extraterrestrial millennialism has never been an ideology with broad popular support. Instead, its adherents fall into two categories. The first, and most influential, are its popularizers, who may be thought of as the "high priests." This group consists of the rocketeers, technocrats, and politicians who espoused its promise for mankind as a justification for the construction of rockets for use in warfare. Sometimes this justification was sincere, especially in the case of the rocketeers who for psychological reasons did not want to be remembered as solely the purveyors of weapons of mass destruction. At other times, the ideology was employed by politicans as a conscious

means of cloaking the escalation of munitions within a hopeful vision of a future in which weaponry itself would be transcended. The second group of adherents can be described as the "true believers," those members of the public who saw in exo-millennialism the promise of a futuristic techno-faith which retained much of the traditional framework of Christian millennialism, but without an increasingly anachronistic reliance on the literal truth of Scripture. Gerard O'Neill's plan for space colonization attempted to inspire a broad-based exo-millennial social movement in American society in the 1970s, and inspired many in this second group to adopt his scheme as the product of a prophet. The failure of O'Neill's plan to inspire a successful and broad-based social movement reveals much about the inherently elitist dreams of exo-millennialism. The rapture of an elect few through technology inspired, roughly, about as many believers as could be feasibly launched off the Earth in a given year using modern rockets.

This dissertation tells the story of not only the rising development and popularity of extraterrestrial millennialism in Western and American culture from the 17th through the 20th century, but also the decline of the belief system in the Western world after the successful landing of men on the moon in 1969. In this dissertation, O'Neill's colonies become simultaneously the boldest political and social manifestation of extraterrestrial millennialism in world history, as well as the beginning of the end for the ideology in the wake of a globally disseminated series of images of a previously unseen planet Earth brought back from the Apollo moon missions. Beginning in the Space Age, the liberating potential of spaceflight became severely questioned as the violent extraterrestrial millennialist language of Earth disdain and destruction became more strident, open, and for many, disturbing. The reaction against the Space Age coalesced into an opposite era – an Earth Age – which, while equally as apocalyptic in its predictions of the possible

fate of the Earth, was characterized by the emergence of a fervent social movement which advocated for the preservation and salvation of the planet instead of its departure and abandonment. Within the design of O'Neill's colonies can be seen the tension between these two great eras, and the attempt by spaceflight enthusiasts to adapt to the transition in American spatial and celestial values from the exploration of a supposedly virtuous and holy cosmos to the salvation of a newly holy Earth. Both eras were marked by existential fear and dread regarding the fragility of the Earth and the future of mankind, and O'Neill's colonies, if nothing else, offered a psychological and fantastical respite from such fear for some during a brief period in the 1970s.

The first chapter traces the metaphysical background of the development of spaceflight technology in Europe and the United States beginning in the seventeenth century. This chapter involves short studies of the major European and American rocketeers and the metaphysical ideas which motivated their research. Arguably the nations with the deepest and most fervent traditions of native millennial belief, the rocketeers and thinkers of Nazi Germany, Soviet Russia, and the United States shaped the metamorphosis of Christian apocalypticism into its secular and technological counterpart of extraterrestrial millennialism.

The second section focuses on the period between 1957 and 1972, the "Space Age," and discusses the emergence of the "Earth" as a powerful metaphor and symbol as a result of spaceflight technology and astronautics. The emergence of the Earth metaphor created, I argue, a subsequent "Earth Age," which eventually usurped the Space Age. The set of beliefs which defined the emerging "Earth Age" involved a contrary envisioning of the future destiny of humankind, one at odds with the scientific and technological progressivism of the Space Age. O'Neill's idea attempted to syncretize the utopian futures

of both Space Age human destiny and Earth Age human destiny. An understanding of the interaction between the environmental movement and the spaceflight movement in the 1960s and early 1970s is crucial to understanding the emergence and popularity of O'Neill's idea. At the same time, I discuss the development of the Earth metaphor in the ecumenical and evangelical theological communities, so as to show the different perspectives American Christian denominations arrived at in their encounter with spaceflight and the Earth. The 1960s and 1970s saw a rise in Christian fundamentalism, as well as an across-the-board rise in the popularity of apocalyptic literature issued by both Biblical literalists, spaceflight advocates, and environmental prognosticators. It is in this context that O'Neill's space colonization scheme comes to life and begins to attract a passionate following.

The third section examines the institutional and cultural history of O'Neill's colonization scheme. It focuses on the simultaneous rise in passionate popularity of O'Neill among spaceflight enthusiasts such as the members of the L5 Society, and the dismissal of the colonization scheme by many prominent environmentalists, theologians, and NASA officials. The collapse of O'Neill's utopian idea signaled an important step in the gradual decline of space exploration throughout the 1970s and 1980s, and it also represented the final conclusion to the Space Age which began with Sputnik. It signaled the exile of extraterrestrial millennialism to the fringes of American fantasy, and the migration of spaceflight advocacy proponents from the 70s Democratic left to the 80s and 90s Republican right.

In a series of chapters near the end of this dissertation, I explore O'Neill's colonization plan by comparing several of its key characteristics with the millennia-old drama of the Christian rapture. The first of these chapters compares the valorization of weightlessness among O'Neill and other spaceflight enthusiasts with the expectation of

self-willed flight on the part of the risen elect after the Rapture. The second of these chapters compares the portrayal of the Earth troubles which supposedly necessitate space exodus in O'Neill's writings to similar themes in Christian prophecy writings. The third chapter in this section compares the space colonies themselves with the Christian vision of the heavenly city. The last two chapters in this section examine O'Neill's colonies by looking at them as inverted or hollow Earths – mini-planets turned away from the frightening reality of a vast and ancient cosmos.

In the conclusion, I explore the legacy of extraterrestrial millennialism, and propose that the ideology is not dead, but instead has been cocooned and nurtured within one of its original incubators – the secretive military-industrial complex of the United States. Spy satellites and the "Star Wars" missile defense system, I maintain, are examples of the technologization of the Puritan Calvinist God still at the heart of extraterrestrial millennialism, and represent a kind of fulfillment of the apocalyptic anticipations of the millennialist natural philosophers of seventeenth century England. In seeking to uncover the hand and will of God in the universe through scientific research and technological experimentation, the extraterrestrial millennialist ideology has helped to guide technology and our assumptions about technology's advance to create the angry, merciless, and capricious God of surveillance and imminent doom at the heart of the Puritan errand into the wilderness, has brought this God closer to Earth, and is at the heart of of a dark and semi-conscious will to destroy the Earth and liberate a miniscule Christian portion of humanity into a lifeless sky.

# EXTRATERRESTRIAL MILLENNIALISM: THE APOCALYPTIC IDEOLOGY OF ROCKETRY

## 1: Changing Aboves: Heaven and Space from Newton to 1900

The linkage of Christian eschatology with technological development set the stage for the spiritualization of the rocket. It would not be until after the Protestant Reformation of the sixteenth century, and after the Age of Exploration, that the techno-Christian imagination would begin to conceive of human material conquest of the vertical realm. Extraterrestrial millennialism would only begin to take shape after the project of terrestrial conquest neared totalization and fulfillment, and after millennial theories became widely propagated and codified through the dissemination of printed matter devoted to such theories.

Each of the rocketeers discussed in the next few sections believed in an idiosyncratic form of extraterrestrial millennialism. Oftentimes, they crafted their philosophy on their own, synthesizing the beliefs of various faiths to justify their work and their passion. However, Christian apocalypticism would always be at the heart of their belief. It is to these commonalities we now turn, while not abandoning an examination of those aspects which differentiate the beliefs of one rocketeer from another. And such a glimpse of the rocketeers will begin with the proto-spaceflight consciousness of a man who did not craft rockets, but instead crafted the apocalyptic and cosmic reality into which the rockets would forge.

## ISAAC NEWTON

> "When I wrote my treatise about our system (*Principia)*, I had an eye upon such principles as might work with considering men for the belief of a Deity; and nothing can rejoice me more than to find it useful for that purpose."[5]

Upon Isaac Newton's death in 1727, a collection of theological and alchemical manuscripts was discovered, consisting of over one million words. Newton had edited and prepared for publication several of these manuscripts, although it appears that he made no effort to publish them during his lifetime. In the last years of Newton's life, rumors swirled around England that the eminent natural philosopher's religious views were strange, and even heretical.[6] However, for the two centuries following his death, Newton's theological and alchemical musings remained in the possession of one family and few scholars perused them.[7] Those that did see them dismissed them as the unfortunate byproduct of an active and intelligent mind, mired in a quasi-medieval and "defunct" worldview. Medieval historian Henry Richards Luard, one of the few scholars to see the theological works prior to the twentieth century, dismissed the importance of Newton's theological manuscripts by observing that they had been composed "apparently from the mere love of writing. His power of writing a beautiful hand was evidently a

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[5] Isaac Newton, Letter to Richard Bentley, December 10, 1692. Cited in *Concepts of Space*, Max Jammer, Cambridge: Harvard University Press, 1957. p. 109.

[6] French scientists of the era who all but worshipped Newton tried to explain their mentor's theological views as the product of derangement brought on by the mental trauma of a fire which was purported to have destroyed many of Newton's early scientific treatises in 1693. This fire never occurred, although Newton did suffer a mental breakdown during that year. See "To Discourse of God," Snobelen, forthcoming, posted at http://members.aol.com/stevesnobelen/religion.doc. Also see Richard S. Westfall. *The Life of Isaac Newton*. Cambridge: Cambridge University Press, 1993. pp. 107-08.

[7] "Newton's Archival Legacy," *The Newton Project*. 2004. *http://www.newtonproject.ic.ac.uk/legacy.html.* March 16, 2004. The Newton Project is an endeavor being undertaken at the Imperial College of London to make available online all of Newton's manuscripts – theological, alchemical, and scientific. It has the support of the British government's Arts and Humanities Research Board, and has also received funding from the National Science Foundation.

snare to him."[8] British astronomer R.A. Sampson suggested in 1924 that Newton's "miscellaneous" works be published and regretted that he did not have time to do it. Whichever editor would someday undertake the task, Sampson warned, "would never quite find his way out of it."[9]

In 1936, Newton's theological and alchemical writings appeared on the auction block at Sotheby's. Most of his alchemical writings went to the economist John Maynard Keynes, who paid 9000 pounds for them. Many of the theological works offered at the sale went to scholar Abraham Yahuda, who purchased them initially as a group investment and then later bought out his partners. However, it was not until 1969 that Yahuda's estate was finally settled and the papers deposited in the Jewish National University and Library in Jerusalem.[10] Between Newton's death in 1727 and the opening of the papers in the late 1960s, no more than a handful of scholars even looked at the manuscripts, and of these scholars, not a single one saw fit to see them through to publication, with nearly all of them dismissing the papers as the useless religious ramblings of a primitive era.

Although the papers became open to scholars in Jerusalem in the early 1970s, it was not until 1991, when a microform edition of Newton's theological and alchemical works was issued, that scholars all over the world had the opportunity to easily peruse them. Since 1991, there has been a virtual revolution in the study of Isaac Newton, his life, his beliefs, and the roots of his scientific ideas. Scholars such as Frank Manuel, Richard Popkin, James Force, Reiner Smolinski, Deborah Harkness, and Steven Snobelen

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[8] J.C. Adams, G. Stokes, H.R. Luard and G.D. Liveing, *A Catalogue of the Portsmouth Collection of Books and Papers written by or belonging to Sir Isaac Newton, the Scientific Part of which has been Presented by the Earl of Portsmouth to the University of Cambridge, drawn up by the Syndicate appointed 6th November 1872*. Cambridge: The University Press, 1888.

[9] Cited in "Publication Efforts," *The Newton Project*. 2004. http://www.newtonproject.ic.ac.uk/publication.html. March 16, 2004.

[10] "The Sotheby Sale," *The Newton Project*. 2004. http://www.newtonproject.ic.ac.uk/sotheby.html. March 16, 2004.

have shown that Newton's theological writings, far from irrelevant, are vital to understanding his life and his science.[11] One matter which all scholars agree on is that Newton not only devoted as much time and energy to his theological pursuits as to his scientific pursuits, but that both endeavors involved the same tools of deduction, interpretation, and proof. According to Newton's biographer Frank E. Manuel, one of the few scholars to examine the natural philosopher's religious writings prior to their microform publication in 1991, Newton's prophetic interpretations, religious principles, criticism of the historical works of Scripture, cosmological theories and system of world chronology all revealed "the same mentality and style of thought."[12] Newton made no separation between his religious studies and his scientific ones. Both were parallel means to the same end – the deciphering of God's plan for humanity and the Earth. Newton adhered to and advanced the common seventeenth century proto-scientific perspective on understanding God. According to this dualistic view, two "books," when read, revealed the will and handiwork of God. One book, the Book of Nature, could be deciphered through scientific investigation of the universe and natural phenomena; the other, the Bible, could be deciphered through detailed analysis and interpretation. Newton endeavored to decipher both, but with the same aim in mind: understanding God and understanding His plan for the end of history.

What the theological manuscripts reveal is that Newton's conception of outer space involved, from the very beginning, the dream of inhabiting and traveling through

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[11] See J. Force and R.H. Popkin, eds., *Newton and Religion: Context, Nature and Influence*, International Archives of the History of Ideas 129. Dordrecht and Boston: Kluwer, 1999; R.H. Popkin, ed., *Millenarianism and Messianism in English Literature and Thought (1650-1800): Clark Library Lectures 1981-82*, Publications from the Clark Library Professorship, UCLA, No. 10. Leiden: E.J. Brill, 1988; F.E. Manuel, *The Religion of Isaac Newton*. Oxford: Clarendon Press, 1974; for the best collections and distillations of the emerging theological scholarship of Newton. Also see James Gleick. *Isaac Newton*. New York: Pantheon, 2003, for a brief discussion of Newton's anti-Trinitarian beliefs, although Gleick provides very little information about his apocalyptic beliefs. Richard S. Westfall's *The Life of Isaac Newton*. Cambridge: Cambridge University Press, 1993 is also very informative.

[12] Frank E. Manuel. *The Religion of Isaac Newton*. Oxford: Oxford University Press, 1974. p. 103.

space. While Newton is given credit for discovering the physical laws that made spaceflight possible, he has never been given credit for imagining the possibility of interplanetary and interstellar flight. It is only through an understanding of Newton's strong apocalyptic and millenarian view of the Bible and human destiny that one can see where his views of space, heaven, God, and the Earth inform both his "scientific" and "religious" theories.

Newton's apocalyptic religious beliefs were greatly influenced by the English millenarian clergyman Joseph Mede. Newton himself said of his own researches into the Book of Revelation, "It was the judiciously learned and conscientious Mr. Mede who first made way into these interpretations and him I have for the most part followed."[13] Mede's treatise *Clavis Apocalypticae* (1627) reordered the various visions of the Biblical prophets into a system which he said proved that the millennium – the return of Christ and the end of the world -- was still to come. At the time, such an interpretation was controversial, since most contemporary scholars adhered to the Augustinian interpretation of Scripture, which saw the Biblical prophecies concerning the apocalypse as allegory. In the Augustinian view, the millennium had already passed, and humanity dwelled in Christ's presence, through his Church. The imagery of the Book of Revelation was dismissed as allegory which had already been fulfilled with the establishment of the Holy Roman Empire in Europe.

Mede, however, was a child of the Protestant Reformation and the printing press. For English theologians of the early seventeenth century, the Bible was now accessible to all interpreters, and the apocalyptic portions of Scripture, long popular outside the Church hierarchy, now became the central focus of Protestant theological conjecture. According

[13] Isaac Newton. "Fragments from a Treatise on Revelation," Appendix A in *The Religion of Isaac Newton*. Frank E. Manuel. Oxford: Oxford University Press, 1974. p. 114.

to Mede's interpretation, the world would last for only six millennia. The Second Coming of Christ, preceded by the return of the Jewish people to Palestine, would usher in the final millennium. Christ would appear above, signaling the imminent destruction of the Antichrist with fire from heaven. Satan would be bound for a thousand years, and there would be a First Resurrection of martyrs and witnesses who would accompany Christ into heaven and rule over the Saved Nations below, a collection of Christians centered around Jerusalem. At the end of a thousand years, Satan would re-emerge, attack the New Jerusalem, but would again be defeated. Finally, the Day of Judgment would arrive, and the living and the dead would be resurrected, with the righteous attaining everlasting life, and the wicked consigned to eternal death in a Hell located at the center of the Earth.[14]

Mede's interpretive schema became the standard by which subsequent English and American apocalypticists would compare their own theories. Aside from Isaac Newton, many other English and American theologians attested to Mede's influence on their apocalyptic interpretations. Geologist Thomas Burnet, astronomer William Whiston, the Puritan divine Cotton Mather, and evangelist Jonathan Edwards all studied Mede and adopted variations of his interpretive schema. One of their central concerns in deciphering these prophecies was to arrive at the approximate date of Christ's return.

One aspect of the apocalypse that troubled Newton and other English apocalypticists was how to interpret Biblical language concerning the Second Coming. All agreed that the Second Coming would be a one-time event and was not an allegory for some historical event in the past. However, the nature of the mysterious occurrences referred to in Biblical prophecy, such as the fiery destruction of the Earth, and the raising

[14] Reiner Smolinski. "The Logic of Millennial Thought," in J.E Force and R.H. Popkin, eds. *Newton and Religion.* Amsterdam: Kluwer Academic, 1999. p. 261.

of the saved into the air, were a matter of spirited debate. Thomas Burnet, a contemporary of Newton, believed that the conflagration prophesied to cleanse the Earth would be a cataclysmic but limited affair, restricted to the Italian peninsula, and centered on the Papacy in Rome. The agent of this cataclysm would be the volcanoes that had plagued Italy since the dawn of time.[15] William Whiston, on the other hand, believed that the fire from heaven would be more of a display of natural terror than a true natural disaster. Whiston believed that a comet – perhaps the same comet to which Whiston had previously ascribed Noah's flood – would pass close to the Earth, setting off a series of events that would result in the remaking of the Earth and its inhabitants.[16] Newton retained a similar view concerning comets, believing that they could very well be God's chosen agent of terrestrial destruction. The comet of 1680, which Newton and Halley had studied together, Newton believed would someday fall into the sun, thus causing the sun to increase in luminosity and heat and subsequently burn the Earth to a crisp. As a result, Newton theorized, God would have to repopulate the Earth after this calamity.[17]

The status of the chosen elite at the Second Coming of Christ elicited no narrower range of theories. Mede himself held a materialistic view of those that remained after the fiery destruction of the Antichrist and his minions. These "Saints" would be of "two sorts": "*The deceased Martyrs*," who would regain the bodies they had during life and physically accompany Christ back into "Heaven"; and the "*Living*" Saints, those Christians and converted Jews living at the time of Christ's return who would not perish in the conflagration. Both groups of Saints, claimed Mede, would possess actual physical form; he did not imagine them to be incorporeal or ethereal, but actual.

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[15] Thomas Burnet. *Sacred Theory of the Earth*. Basil Willey, ed. Carbondale: Southern Illinois University Press, 1965. p. 289. Cited in Smolinski, p. 268.
[16] William Whiston, *A New Theory of the Earth*. 5th ed. London: 1737. p. 287. Cited in Smolinski, p. 272.
[17] Stephen D. Snobelen. "To discourse of God: Isaac Newton's heterodox theology and his natural philosophy," unpublished manuscript. Online at *http://members.aol.com/stevesnobelen/religion.doc*.

According to Mede, the Saints' physical form would be uncorrupted, so that they would have no need of carnal pleasures such as food, drink, and sexual intercourse. However, since they were material entities, these Saints needed a place to live: "…[B]ut for their mansion and habitation," wrote Mede. "they have need of a place of abode."[18] Being physical, but uncorrupted, they were "glorified," but not totally immaterial.

Newton's theological writings show that he, too, was attempting to discern what the nature of these Raised Saints in the New Heavens would be. Newton did not explicitly state that he believed they would inhabit physical bodies, but his description of them provides them with superhuman powers of flight and movement. During the millennium, Newton predicted a split between the mortals who would remain on Earth and the "children of the resurrection," those just souls that would inhabit a New Jerusalem in heaven. Newton objected to those contemporary apocalypticists, such as Burnet, who claimed that the "children of the resurrection" would live on Earth in the New Jerusalem with the divine mortals. "[T]o conceive that the children of the resurrection shall live among other men and converse with them daily as Mortals do with one another… is very absurd and foolish," claimed Newton. "Do Men convers with Beasts and Fishes, or Angels with men?"[19] Instead, Newton believed that these two groups of post-apocalyptic divines would be separate and unequal, with the Heavenbound saints ruling, with Christ, over the Earthbound below.

Newton's theological writings reveal that, despite his acceptance of Copernican heliocentrism, his mind was still wedded to the celestial system of hierarchy endemic to the medieval worldview. Although Newton admitted that God could be anywhere, even "in the lowest Hell," the physicist believed that "the enjoyment of his blessings may be

[18] Smolinski, "The Logic of Millennial Thought," pp. 276-77.
[19] Cited in Manuel, p. 100.

various according to the variety of places, and according to this variety he is said to be more in one place less in another, and where he is most enjoyed and most obeyed, there is heaven and his Tabernacle and Kingdom."[20] Newton believed that the sky was inherently a more holy location than the Earth, much in keeping with an explicit Christian cosmography. The decentralizing effects of Newton's cosmology did not have the effect of loosening the moorings of his spatial system of values.

For Newton, the "children of the resurrection" would have the power of self-willed flight through the Heavens, a power they would share with Christ and the Angels. "As fishes in water ascend and descend, move whether they will and rest where they will," Newton wrote in the 1680s, "so may Angels and Christ and the Children of the resurrection do in the air and heavens." Newton went on to attempt to prove, through deduction, that the celestial realm was populated by exobiological and extraterrestrial beings: "As all regions below are replenished with living creatures… so may the heavens above be replenished with beings whose nature we do not understand…" And these risen Saints would be extraterrestrials of awesome mobility and power, capable of lording over all those remaining on the remade Earth.

> And as the Planets remain in their orbs, so may any other bodies subsist at any distance from the earth, and much more may beings, who have a sufficient power of self motion, move whether they will, themselves where they will, and continue in any regions of the heavens whatever, there to enjoy the society of one another, and by their messengers or Angels to rule the earth and convers with the remotest regions. Thus may the whole heavens or any part thereof whatever be the habitation of the Blessed, and at the same time the earth be subject to their dominion.[21]

Newton believed that these "children of the resurrection" would have no need to be confined to a particular place, as Mede claimed, and that it was only logical to deduce

[20] Cited in Manuel, p. 101.
[21] Cited in Manuel, pp. 101-102.

that if they were in a state of uncorrupted bliss, they could seek whatever living quarters they pleased: “And to have thus the liberty and dominion of the whole heavens and the choice of the happiest places for abode seems a greater happiness then to be confined to any one place whatever.”[22] Newton not only posited the existence of a form of divine extraterrestrial life, but also envisioned that the Elect, after the rapturous millennium, would be provided with the power of self-willed interstellar flight. The division of the elect from the damned, the ultimate eschatological climax of the Christan millennialist drama, is in Newton’s mind a physical division to be made real upon the fulfillment of the prophetic events encoded in the Bible. At the end of time, Newton believed that an elite portion of humanity would depart the planet and fly through the heavens – heavens which he had helped conceptualize with "an eye upon such principles as might work with considering men for the belief of a Deity." As Frank Manuel wrote of Newton, "[he]… seemed to fancy himself soaring through the heavens."[23]

English apocalypticism became even more popular in colonial New England. The Massachusetts Bay Colony’s Puritan minister Cotton Mather (1663-1728), a contemporary of Isaac Newton’s, also devised a set of apocalyptic theories based on the Clavis Apocalypticae of Joseph Mede. Mather’s interpretation of Biblical scripture was very similar to Newton’s; however, Mather was an even stricter literalist. Mather imagined, like Newton, that the “children of the Resurrection” would possess the power of weightlessness and willful flight. “Their Bodies will be so Salted by the Garments of Light, which GOD will putt upon them, that they will become Incorruptible under it. Luminous Bodies!... Not ceasing to be Bodies, or turned into meer Spirits; They will be Material still; but highly Spiritualized… Equal to the Angels: Doubtless, Able to Move,

[22] Cited in Manuel, pp. 101-102.
[23] Manuel, p. 102.

and Mount, and Fly, as the Angels do."[24] Mather's extraterrestrial beings would not be angels; instead, they would be another form of life, a kind of future superhuman, with bodies like men. "They will be Material still…" he writes.[25]

Mather concurred with Mede that the Raised Saints would require an abode after their ascension. Mather adopted a popular contemporary interpretation that the New Jerusalem which the Saints would inhabit was a city above, in the sky, or in the heavens; such was the literal interpretation the Scriptures demanded, he believed. Mather's "City of God in the New Heavens" would extend for 1500 miles and be located over a reconstituted Israel. Mather's description of this hovering city is mysterious, seemingly out of the pages of twentieth century science fiction: "The Situation of [New Jerusalem] will be in a Part of the Atmosphere, which will be nearer to the Earth, where the Nations are to Walk in the Light of it, than as yett it is, and it will be conspicuous to the Nations." Similarly, Mather felt that the "children of the Resurrection," while possessed of the power of free heavenly mobility, would still possess "An Heavy Tendency to the Earth… they will be so disencumbred from it, that They shall mount up with Wings as Eagles."[26]

In their interpretations of scripture, Newton, Mather, Burnet, and Whiston reveal the metaphysical underpinnings present at the dawn of the Age of Reason. All believed that history progressed toward a definite goal – the Second Coming of Christ. And the promise of the vertical ascension of the blest could never be decoupled from the apocalyptic drama. Few elements of Christianity remained as constant – and as absolutely necessary to the fulfillment of the faith's historical plan – as the end-time

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[24] Cotton Mather. *The Threefold Paradise of Cotton Mather*. Reiner Smolinski, ed. Athens: University of Georgia, 1995. p. 255.

[25] Mather's vision of risen and luminous bodies had a long pedigree in medieval and Renaissance thought. For instance, the Dominican friar Savonarola, in his *Compendium of Revelations*, envisioned an identical destiny for heaven's inhabitants, their bodies freed of weight, they floated effortlessly about a Renaissance garden heaven.

[26] Cotton Mather, "Problema Theologicum," and *Threefold Paradise*. Cited in Smolinski, "The Logic of Millennial Thought."

ascension of the elect. Through the great minds of the Scientific Revolution, this important aspect of Christianity became increasingly the project of technology and scientific research conducted by men, instead of just a miracle occasioned by God.

The apocalyptic dream of the separation of the heavenbound and the earthbound at the Second Coming of Christ began to acquire materiality in seventeenth and eighteenth century England. Guided by the Biblical language of heavenly ascension and perfection and Earthly depravity and inevitable destruction, the apocalyptic theologian/philosophers of England began to create the metaphysical framework for human entry into outer space. They did not call the region beyond the Earth "space" yet; they did not think of it, as modern science does today, as a null, cold, and inert realm. They imagined the region beyond the sky as materially empty but spiritually full, populated by extraterrestrial beings of almost limitless powers. At the same time, they imagined the day when humanity, cleansed of its baser and non-Christian peoples, would split, with one portion inhabiting a remade Earth, and the other "Equal to the Angels," superior, dominant, and comparatively omnipotent.

The glorious ascension of which men like Mather and Newton dreamed could only come about through a nearly simultaneous period of destruction and suffering the likes of which humanity had never experienced. Thomas Burnet imagined that the Scriptures were describing the "Liquefaction and Dissolution" of the Earth in much the same way an alchemist would transform metals in a fired spoon: "…[I]f you would cast the Earth into a new and better mould," he wrote in his Sacred Theory of the Earth, "you must first melt it down; and the last Fire, being as a Refiner's fire, will make an improvement to it, both as to matter and form." The imperfect Earth, at the center of which lay an evil Hell, would in the final hours of the six millennia of human history be cleansed and remade anew. In Christianity and in the hyperliteral interpretations of

prophecy begun by Mede and continued by Isaac Newton, Cotton Mather, and later Jonathan Edwards, William Miller, Joseph Smith, and Hal Lindsey, the ascension of an elite fraction of humanity into the Heavens would signal the beginning of the destruction of the Earth. Within their apocalyptic perspective, we can glimpse the birth of the theo-scientific secular religion of extraterrestrial millennialism. In the twentieth century, the technology of rocketry would make physically possible the dual aspects of the eighteenth century theo-scientific apocalyptic myth – the destruction of the Earth and the escape of the elite from the Earth – and the progenitors of the rocket, using the blueprints of the universe set down by the apocalypticist Isaac Newton, would adopt the assumptions of history, human destiny, and Earthly depravity at the heart of the Christian apocalypse.

## THE FIRST AND SECOND GREAT AWAKENINGS

The anticipation of apocalypse which possessed England's scientific and religious scholars also took hold in colonial New England. Cotton Mather predicted not one, but three different dates for the return of Christ, the almost total destruction of the Earth, and the split of humanity into the Heavenly and the Earthly.[27] And Mather was not alone in predicting this imminent end. Jonathan Edwards, the fire and brimstone Massachusetts minister of wilderness Massachusetts, whose sermons came to define the "Great Awakening" period of American religious fervor in the 1730s and 1740s, evinced a similar disdain for the future of the planet, and a similar hope for the evacuation of the virtuous Christian portion of mankind into the starry heavens. “The world is not our abiding place," Edwards preached in his sermon *The Christian Pilgrim*, "Our continuance here is but very short. Man’s days on the earth, are as a shadow. It was never designed

[27] Smolinski, "The Logic of Millennial Thought," 259-89.

by God that this world should be our home."[28] Edwards retained a deep belief in the spatial hierarchy of Christianity. "Christ, as he is God, is infinitely great and high above all," he claimed. "He is higher than the heavens, and higher than the highest angels of heaven."[29] Edwards always sought to impress upon his congregation their inconsequentiality and the inconsequentiality of the entire cosmos in the eye of God. "What art thou in the hands of the great God, who made heaven and earth by speaking a word?" he preached in the sermon, "The Future Punishment of the Wicked." "What art thou, when dealt with by that strength, which manages all the vast universe, holds the globe of the earth, directs all the motions of the heavenly bodies from age to age, and, when the fixed time shall come, will shake all to pieces?"[30]

Edwards, like Mather, Newton and Mede, believed that the earth and all of its life would soon be annihilated in a total cataclysm. However, Edwards did not envision that the Earth he currently preached from would exist or be cleansed for future habitation, as Mather had insinuated. Before the final annihilation, Jesus would return; God's elect would be taken up into the sky, into heaven, to live a holier existence on a "new earth," an even newer world, a more perfect locale "in some glorious place in the universe prepared for this end by God, removed at an immense distance from the solar system." This earth, containing Edwards' Northampton and Stockbridge and New England entire, would be destroyed, its trees burned to ashes, the whole planet transformed into a smoldering cinder. According to Edwards' interpretation of Scripture, at the end of time, which was imminent, "this globe, with all its appurtenances is clear gone, out of the way," he wrote. In its place would be provided "a new one, materially as well as in

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[28] Jonathan Edwards, "The True Christian's Life, A Journey Toward Heaven," in *The Works of Jonathan Edwards*. Volume 17. Mark Valeri, ed. New Haven: Yale University Press, 1999. p. 436.
[29] Jonathan Edwards, "The Excellency of Christ," in *The Works of Jonathan Edwards*. Volume 19. M.X. Lesser, ed. New Haven: Yale University Press, 1999. p. 565.
[30] Edwards, "Future Punishment of the Wicked,"

form." The old Earth, the old Massachusetts, with its wolves, and its trees, and its hills, and its fish, would be left behind by the elect, to become "the place of the damned."[31] The Earth as we know it would become Hell, fiery, filled with the torment of the sinful and those left behind. The new Earth would be elsewhere in the universe, and the elect would rise to this world before the subsuming of the old Earth into Hell.

As Edwards dreamed about this apocalyptic day, he regaled his congregations with brutal depictions of the torment sure to be visited upon the iniquitous and unbelieving. While the Earth might be for some an antechamber to heaven, Edwards reminded his followers that their more likely destiny would be the pain of eternal damnation. Instead of floating upwards, towards the promised new world in the sky, the "new earth" above, the souls of men and women were more apt to sink into the dirt and rocks of Massachusetts.

"Your wickedness makes you as it were heavy as lead and to tend downwards with great weight and pressure towards hell," he told a distressed and weeping crowd in 1741 in Enfield, Connecticut. God, Edwards told his congregation, was infinitely displeased with mankind, and could at any second consign the entire human race to "the fierceness of his wrath in hell":

> O sinner! Consider the fearful danger you are in: it is a great furnace of wrath, a wide and bottomless pit, full of the fire of wrath, that you are held over in the hand of that God, whose wrath is provoked and incensed as much against you, as against many of the damned in hell. You hang by a slender thread, with the flames of divine wrath flashing about it, and ready every moment to singe it, and burn it asunder.[32]

To counter this leaden weight, the downward pull of Satan, Edwards imagined a countervailing and physical pull, a light tug towards the stars, a rocket of God. "Let the

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[31] Cited in Reiner Smolinski, "Apocalypticism in Colonial North America," in *The Encyclopedia of Apocalypticism*, Volume 3. Stephen J. Stein, ed. New York: Continuum, 1998. pp. 59-60.
[32] Jonathan Edwards, "Sinners in the Hands of an Angry God," in *The Works of Jonathan Edwards*. Volume 22. Harry S. Stout et al, ed. New Haven: Yale University Press, 1999. pp. 410-412.

most perfect union with God be represented by something of an infinite height above us," he wrote, "and the eternally increasing union of the saints with God, by something that is ascending constantly towards that infinite height, moving upwards with a given velocity, and that is to continue thus to move to all eternity."[33]

Up and down, into the depths of the Earth and hell, or off of the damnable sphere and into the freedom of God's sky: this was the choice presented to Edwards' weeping flock, with only one choice offering bliss, the other offering eternal pain and suffering. Heaven and hell lay in wait; the earth with its heaviness, its gravity, was close to hell, and far from heaven. Humanity was closer to damnation than salvation, and yet Edwards held out the hope of salvation for his flock – a new earth elsewhere in the universe.

Edwards' conception of the apocalypse and the coming deliverance of mankind from a damnable and hell-centered planet was no idle speculation concerning a dead allegory. For the Protestant settlers of the American continent, the Bible, and especially the Book of Revelation, was a living text, the literal and actual word of God, pertinent for all time – a blueprint for history, to be deciphered for clues to the coming return of Christ, the deliverance of the elect, and the subsequent fate of the planet. When Edwards professed a belief that an elite branch of humanity would be taken off of the Earth, and settled onto another planet, in another solar system, he did not regard this belief as an allegorical fantasy. The Bible held clues to the future of mankind and when the prophets in the Bible spoke, they spoke the Truth. Edwards longed for the day of the destruction of the Earth, and for those saved like himself to travel off of the earth to another home in the stars.

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[33] Jonathan Edwards, "Dissertation Concerning the End for Which God Created the World," in *Jonathan Edwards*, Clarence H. Faust and Thomas H. Johnson, eds. New York: American Book Company, 1935. p. 347.

After reading the rapture fantasies of figures such as Isaac Newton, Cotton Mather, and Jonathan Edwards, we catch a glimpse of what one might call a "proto-spaceflight" consciousness, the faint echo of the millennial desire to be free of a doomed Earth and to glide effortlessly through space, with or, at least, towards God. By comparing these pre-industrial imaginations of the prophesied rapture with our contemporary dreams of spaceflight, we can come to see the modern passion for extraterrestrial deliverance as a form of technologized rapture fantasy – a dream divested of explicitly Christian imagery and yet retaining the essential structure and elements of the apocalypse and ascension.

Only with the arrival of the Industrial Revolution in England and America in the early nineteenth century did the prospect of a mechanically-powered mode of heavenly attainment begin to seem possible. With the arrival of automation and the establishment of factory-towns and their centralization of labor, the rural tradition of sustenance from farming and small-scale textile creation began to erode quickly. Those areas of the country where the dislocation created by this shift were felt most profoundly were those areas which experienced the strongest upswing in evangelical and emotional revivalism.[34] Upstate New York would become known during the 1820s and 1830s as the "burned-over district," not because of wildfires but because of the fast-moving, fiery evangelicalism which swept across the region. From this land emerged Mormonism; from southern Vermont and Massachusetts, which experienced similar tides of economic and technological change, emerged Adventism. Both Mormonism and Adventism were exclusively "American" religions in that they were not transplanted from Europe, and that their fervent millennialism was always couched in the context of the United States'

[34] See Anthony Wallace. *Rockdale: The Growth of an American Village in the Early Industrial Revolution*. New York: Knopf, 1978.

perceived role as the “city on the hill,” and the “new Israel,” from which an example to all nations would be erected, and whose establishment was a sign of the approaching return of Christ.

The wave of revivalism that swept across the United States in the 1820s and 1830s has become known as the “Second Great Awakening,” to differentiate it from the first "Great Awakening" of which Jonathan Edwards’ pre-Revolutionary War evangelism was a central facet. This Second Great Awakening spurred not only the creation of the new American religions of Mormonism and Adventism but also a renewed missionary and evangelical zeal among established denominations such as the Methodists, Baptists, Congregationalists, and Presbyterians. With the spread of millennial excitement came a newly impassioned American attention to the portents of the heavens. Whereas in the early years of colonial New England, Puritan divines such as Increase and Cotton Mather could still direct their flock’s attention to the sky and conjure up an image of the cosmos more medieval than modern – more heaven than Newtonian space – by the 1830s, with the arrival of powerful new transportation and labor technologies such as the railroad and factory, the prospect of a heaven attainable through human ingenuity began to become conceivable. Indeed, the railroad promised and delivered Americans the mechanical transcendence of the horizontal space of the North American continent; to dream of a similar mechanical transcendence of the vertical space of the air and, subsequently, cosmos, required no great leap of logic. During this era, millennialism, technological advance, and as historian Ernest Lee Tuveson has noted, the “manifest destiny” of the United States, all became tightly interwoven. Each victory over the forces of nature spurred another round of apocalyptic alienation and millennial hope and each successful

expansion of the nation seemed to signal God's blessing that all was proceeding according to plan.[35]

Between 1820 and 1870, and particularly in the 1830s, there occurred a rise in American cognition of the celestial cosmos as an arena with increasing meaning for the destiny of the young nation. Comets, meteor showers, and eclipses made dramatic appearances, stoking ancient imaginings of both dark and hopeful portents, and reflecting and feeding into the rising millennialism of the era. The religious and cosmic awakening of this period served not only to pave the way for the technologization of outer space that would began to take shape, both in engineering and fiction, in the last decades of the nineteenth century, but also served to further wed the American consciousness to an anxious brand of extraterrestrial imperativism. Heaven could *not* wait, and the quickening pace of technological and industrial power became, for many, a sign of the approaching fulfillment of Christian apocalyptic prophecy.

**THE 1830S**

The Leonid meteor shower of November 13, 1833, was the most dramatic astronomical display ever to occur in the history of the United States. In the still hours of the early morning, an estimated 150,000 meteors streaked across the night sky, casting shadows, depositing colorful trails in their wake, and occasionally sizzling and crackling as they immolated themselves in the upper atmosphere. For years afterward, the shower exerted a strong influence on the collective memory of the young nation. "Nor is the memory of this marvelous scene extinct," proclaimed a popular centennial history published in 1878. "Its sublimity and awful beauty still linger in many minds, who also remember well the terror with which the demonstration was regarded, and the mortal fear

[35] See Ernest Lee Tuveson. *Redeemer Nation: The Idea of America's Millennial Role*. Chicago: University of Chicago Press, 1968.

excited among the ignorant that the end of the world had come."[36] Fifty years later, astronomy textbooks were still noting how the 1833 Leonid meteor shower "caused great consternation among the ignorant and superstitious."[37]

On a South Carolina plantation, the slaves believed the world was ending. "Shrieks of horror and cries of mercy could be heard from most of the Negroes of three plantations," recalled a white overseer. "…[I]t is difficult to say which excited me most – the awfulness of the scene, or the distressed cries of the Negroes. Upwards of one hundred lay prostrate on the ground, some speechless, and other uttering the bitterest moans, but with their hands raised, imploring God to save the world and them. The scene was truly awful…"[38]

Mormon prophet Joseph Smith, then in Nauvoo, Illinois, witnessed the event and declared it a fulfillment of an apocalyptic passage in the Book of Revelation. He described the night in his diary: "About 4:00 AM I was awakened by Brother Davis knocking at my door and calling on me to arise and behold the signs in the heavens. I arose, and to my great joy, beheld the stars fall from heaven like a shower of hailstones: a literal fulfillment of the word of God, as recorded in the Holy Scriptures, and a sure sign that the coming of Christ is close at hand."[39]

Abraham Lincoln, during the Civil War, recalled the apocalyptic fever which gripped many Americans on that night. "When I was a young man in Illinois," Lincoln told a gathering that included the poet Walt Whitman, who recorded the President's words, "I boarded for a time with a Deacon of the Presbyterian church. One night I was

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[36] R.M. Devens. *Our First Century*. Springfield, Massachusetts: C.A. Nichols & Co., 1878. p. 329.
[37] J.A. Gillet and W.J. Rolfe. *Astronomy for the use of Schools and Academies*. New York: Potter, Ainsworth & Co., 1882. p. 313.
[38] R.M. Devens, *Our First Century*. p. 330.
[39] *History of the Church of Jesus Christ of Latter Day Saints*. Volume I. Salt Lake City: Deseret News, 1902.

roused from my sleep by a rap at the door and I heard the Deacon's voice exclaiming, 'Arise, Abraham, the day of judgment has come!' I sprang from the bed and rushed to the window, and saw the stars falling in great showers!" Lincoln used this story to urge calm, however. After seeing that the constellations had not moved despite the plummeting stars, he claimed he continued watching the spectacle, only with wonder instead of fear.[40]

Even to this day, the Seventh-Day Adventist Church reads divine meaning in the events of November 13, 1833. Then just a seed within the fledgling evangelical movement led by the apocalyptic William Miller, the Church in later years saw the meteor shower as confirmation that the world was on the edge of the abyss, and that it was only a short time before the return of Christ to Earth. One of the Adventist church's most widely distributed texts, *Our Day in the Light of Prophecy*, devoted an entire chapter to the Leonid meteor storm of 1833. The storm, the Church claimed, fulfilled Christ's apocalyptic prophecy in the Book of Matthew: "The stars shall fall from heaven"; and in Revelation 6:13: "The stars of heaven fell unto the earth, even as a fig tree casteth her untimely figs, when she is shaken of a mighty wind." According to the Adventist Church, the meteor display was "a signal that the hour of God's judgment was drawing near," and that subsequent to the event many began to turn to William Miller's message of imminent Rapture.[41] The American religious sects which emerged from this era increasingly sought actual, material, and immediate transportation into the celestial realm, and set the stage for a broader imagination of extraterrestrial deliverance in the century to come.

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[40] Jim Vertuno. "Brilliant Leonid storm likely fodder for later Lincoln speech," *Houston Chronicle*. November 19, 1999.
[41] W.A. Spicer. *Our Day in the Light of Prophecy*. Washington, D.C.: Review and Herald Publishing Association, 1918. pp. 93-102.

## MILLERISM AND ADVENTISM

Millerism's preoccupation with ascension and the events of the sky became the dominant way by which the new religious movement was viewed by outsiders. Peter Hough, later to become an elder and preacher in the Adventist Church, recalled how the meteor shower of 1833 prompted him to adopt Miller's teachings as his own. Brought up on apocalyptic prophecy at an early age by his father, Hough pored over apocalyptic passages in the large Bibles his father owned. His father had himself come to believe in prophecy and apocalypse through the occurrence of the "Dark Day" – a day in 1780 when the sun was completely and mysteriously blotted out. Hough claimed that the meteor shower of 1833 "confirmed my former convictions of the end being near and revived the history of the darkening of the sun, which gave shape and consistency to the whole."[42] Miller talked of a "Second Advent," when Christ would return in glory to the Earth, just as prophesied in the Book of Revelation. Using a mathematical interpretation of Biblical prophecy, Miller, like Newton and Edwards before him, set a date for the end of the world: April 3, 1843. Over the next ten years, Miller convinced thousands of Americans that the end of the world was imminent; preaching to packed crowds in major Northeastern cities, he sent congregations into paroxysms of joy and anguish. The meteor shower of 1833 became a seminal event in the history of Miller's church and in the lives of his followers, now called Millerites. Portents were in the heavens, and the Millerites fully expected to levitate to heaven with Christ in the near future. The return of Halley's Comet in 1835 further excited Miller and his sympathizers.

Miller predicted the consummation of the Earth in flames and the utter destruction of the planet in words reminiscent of those used by Edwards a century before. John

[42] Isaac C. Wellcome. *History of the Second Advent Message and Mission. Doctrine and People.* I.C. Wellcome: Yarmouth, ME, 1874. p. 254.

Greenleaf Whittier, the American poet, curious at the uproar caused by Miller's prophecies, attended a Millerite camp-meeting in April 1842. He was dismayed at the language of planetary hatred and indifference employed by Miller. "I do not, I confess, sympathize with my Second Advent friends in the lamentable depreciation of Mother Earth even in her present state. I find it extremely difficult to comprehend how it is that this goodly, green, sunlit home of ours is resting under a curse… September sunsets, changing forests, moonrise and cloud, sun and rain – I for one am contented with them. They fill my heart with a sense of beauty." But the Millerites expressed little care at the bounties of nature, with their hearts and attention fixated on a promised deliverance into the ominous sky. "This year, according to our faith, is the last year that Satan will reign in our earth," Miller wrote the elders of his congregation in early 1843. "The kingdom of the earth will be dashed to pieces."[43]

For the American public, Millerism became associated with an extraterrestrial yearning bordering on fanaticism. Numerous newspaper reports of the era, which were often highly critical of the Millerite movement, claimed that Miller had told his followers to fashion themselves "ascension robes," white garments or heavenly spacesuits designed for the trip to the celestial heaven. While these reports have turned out to be hoaxes and rumor, they show the popular perception of the Millerites at the time – as a group of proto-extraterrestrialists focused firmly on ascension into heaven. Whether Miller and his flock actually fashioned such robes is beside the point. The language of the Millerite movement was informed by the same spatial hierarchy of holiness and the same dream of ascension and escape from terrestrial destruction that Isaac Newton, Cotton Mather, and Jonathan Edwards proclaimed as the prophesied destiny of mankind. In its early years,

[43] Clara Endicott Sears. *Days of Delusion: A Strange Bit of History*. Boston: Houghton Mifflin, 1924. p. 97.

Adventism can be seen as one of the first "UFO" faiths, closely associated with a mysterious, elitist and rapturous ascension to a new existence in heaven. At the same time that Adventism was probing the heavens for signs of imminent ascension, the early Mormon Church was formulating extraterrestrial doctrines of even greater complexity.

## MORMONISM

From its very inception, the Church of Latter-Day Saints possessed an open attitude toward scientific and technological revelation. Discoveries in science would always confirm God's power, and Mormon doctrine could be altered according to changing circumstances.[44] Joseph Smith's own writings show that he was preoccupied with the existence of other planets and the eventual migration of the elect into the sky -- so much so that he situated God Himself in a supposedly actual star system and conceived of God's elect as inhabiting a planet orbiting that star. In Smith's conception of the universe, the seat of God was then a real and material place. God was, for Smith, a form of extraterrestrial life. One can see clearly how Mormonism's embrace of the vastness of the material universe and its literal situation of God and extraterrestrial super-men within that universe represent a logical step towards conceiving of space travel as a form of religious pilgrimage.

In *The Pearl of Great Price*, one of the bedrock documents of Mormonism, purportedly translated from a papyrus discovered by Joseph Smith himself, Abraham tells of the physical location of the seat of God. Abraham came upon this information through the use of the "Urim" and "Thummim," two 'seer-stones' later claimed to have been found and employed by Smith to make sense of the supposedly ancient documents. In

[44] See Erich Robert Paul. *Science, Religion and Mormon Cosmology*. Urbana and Chicago: University of Illinois Press.

The Pearl of Great Price, Abraham related the name of the master star which lay closest to God's home:

> 1. And I, Abraham, had the Urim and Thummim, which the Lord my God had given unto me, in Ur of the Chaldees;
>
> 2. And I saw the stars, that they were very great, and that one of them was nearest unto the throne of God; and there were many great ones which were near unto it;
>
> 3. And the Lord said unto me: These are the governing ones; and the name of the great one is Kolob, because it is near unto me, for I am the Lord thy God: I have set this one to govern all those which belong to the same order as that upon which thou standest…[45]

It seems clear that in the nineteenth century, Joseph Smith and his followers were moving towards a conception of God as an extraterrestrial being much in the way highly evolved extraterrestrials are thought of today, as capable of guiding human history, moving amongst humanity unseen, and traveling vast distances in the blink of an eye. In some of his writings Smith refers to God as an "exalted man," an extra-holy human since elevated; elsewhere, angels, men, and Gods are described as of the same "species" or "race." Indeed, Mormonism's most radical departure from traditional Protestant cosmology was its extensive doctrinal pluralism. Theoretically, all devout Mormons could become Gods through spiritual ascension through the celestial hierarchy. In this way, the Mormon approach to the cosmos bore many similarities to the emerging techno-Christian conception of the universe. Through technology, men could become as Gods in much the same way Mormonism believed such evolution was possible through spiritual advancement. The habitation of God located around a particular star was thus not as strange an insight as it would have been in previous incarnations of Western Christianity.[46]

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[45] *Pearl of Great Price.* Abraham 3: 1-3.
[46] See Erich Robert Paul. *Science, Religion and Mormon Cosmology*.

Elsewhere in *The Pearl of Great Price* God tells Moses of the existence of other planets, lorded over by God, and also redeemed by Christ: "And worlds without number have I created; and I have also created them for mine own purpose; and by the Son I created them, which is mine Only Begotten." In this passage, God begins to take on the characteristics of a higher extraterrestrial being such as those imagined to exist by contemporary believers in extraterrestrial life. According to Mormon doctrine, then, all the other planets created by God are also populated, to a certain extent, by Christians. But God also tells Moses that He will not communicate information about these other worlds: "But only an account of this Earth, and the inhabitants thereof, give I unto you." In the next passage, however, God admits to Moses that he has already destroyed some of these other worlds: "For behold there are many worlds which have passed away by the word of my power." The Mormon God is destroyer as well as creator; on all worlds is the apocalypse nigh, the threat of imminent annihilation everpresent.

Early Mormon writings and teachings reveal the cultural movement in the nineteenth century from an abstract form of Christian millennialism to the more literal and materialistic forms popular in Christian fundamentalism and extraterrestrial millennialism. Newton and Mather's hazy predictions of extraterrestrial beings of unlimited movement and pure spirit began, in the bedrock teachings of the Mormon faithful, to acquire definite shape, form, nature, behavior and location. While Newton could imagine the "children of the resurrection" flitting through the vastness between planets, Joseph Smith imagined, and named, definite destinations for that material flight of the elect.

**DARBYITE DISPENSATIONALISM**

While Millerism and Mormonism reflected the increasing extraterrestrialism of American millennial Christianity, the transatlantic journeys of English preacher John Nelson Darby had the greatest influence in planting the seeds of exo-millennialism in the fertile apocalyptic soil of the United States. In the years following the Civil War, Darby traversed the United States proclaiming a mathematical doctrine that promised the imminent ascension into the sky of God's elect. A Biblical literalist who claimed to have discovered Scripture's true prophetic blueprint, Darby headed up a Calvinistic splinter group of the Church of Ireland called the Plymouth Brethren, later known as the Darbyites. Darby is widely credited with planting the seeds for the contemporary millenarian movement in American Protestantism through his preaching of a variant form of Christian millennialism known as dispensationalism. Darby's premillennialism did not differ much from that of Cotton Mather, Jonathan Edwards, or Isaac Newton. Darby's innovation was his strong emphasis on the prophetic and apocalyptic message encoded within the Bible and his stress on the materiality of the "Rapture" mentioned in the Pauline apocalypses. Darby's blueprint became a powerful facet of American Christian fundamentalist belief in the twentieth century.[47]

For fundamentalists who subscribe to Darby's schema, the "Rapture" is the moment at which the blessed chosen of Earth are materially – not spiritually -- elevated to meet Christ "in the air," an event supposedly proclaimed by the apostle Paul in his first letter to the Thessalonians. In the letter, Paul soothes the fears of the Thessalonians:

> For if we believe that Jesus died and rose again, even so them also which sleep in Jesus will God bring with him.
>
> For this we say unto you by the word of the Lord, that we which are alive *and* remain unto the coming of the Lord shall not prevent them which are asleep.

[47] Paul Boyer. *When Time Shall Be No More*. pp. 88-90, 226.

> For the Lord himself shall descend from heaven with a shout, with the voice of the archangel, and with the trump of God: and the dead in Christ shall rise first:
>
> then we which are alive and remain shall be caught up together with them in the clouds, to meet the Lord in the air: and so shall we ever be with the Lord.[48]

In one of his letters to the Corinthians, Paul also refers less specifically to an apocalyptic instance of end-times elevation: "Behold, I show you a mystery; We shall not all sleep, but we shall all be changed, in a moment, in the twinkling of an eye, at the last trump: for the trumpet shall sound, and the dead shall be raised incorruptible, and we shall be changed."[49] For Darbyite believers in the doctrine of pre-millennialism, these two passages refer to a "mystery" previously unprophesied in the Bible and revealed only to Christ's apostles.

Darby also felt that the Bible prophesied the division of the history of the world into particular eras or dispensations. The current dispensation, called the "Church Age," supposedly went unmentioned in the Bible, and Darby was clear not to set dates as to the end of this Age, for fear of enduring the ridicule visited upon previous erroneous prophets. According to Darby, the previous dispensation ended with the crucifixion of Christ and the dispensation to come would begin with the "Rapture." After this elite group of Christian believers ascended into the sky to be with Jesus, a seven-year reign of the Antichrist would begin. This period, called the Tribulation, would end with the Battle of Armageddon, when Christ would return to Earth to defeat the Antichrist and his army, and thereafter would begin the Millennium, the thousand-year period of peace, prosperity, and rule of the Earth by Christ. At the end of the Millennium, Satan would again attempt to rise up, would again be defeated by Christ, the dead would be resurrected and the Last Judgment of the souls of the living and the dead would occur.

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[48] I Thessalonians 4: 14-17.
[49] I Corinthians 15: 51-52.

Darby's identification of the "Rapture" gave a readily identifiable term to a phenomenon repeatedly identified by would-be theologians in their readings of the Bible, and Darby, in the midst of the Industrial Revolution, provided a material and corporeal interpretation to the Pauline promise in I Thessalonians. Believers in Christ, just before the Tribulation, would literally rise up or be "caught up in the air." These events, according to Darby and his followers, were not meant to be thought of as allegorical; to have faith in the literal interpretation of the Bible commanded that this simultaneous ascension and destruction be taken literally.[50]

During Darby's tours of North America, he found great interest in his prophetic interpretation of the Bible among Baptists and Presbyterians in the United States.[51] Darby's prophetic and up-to-date version of apocalyptic Calvinism seemed new and fresh, especially to American clergymen emerging from the fulcrum of the United States's own taste of Armageddon, the Civil War.[52] Darby referred to the whisking away of the elect as a "secret rapture," lent the event a supernatural and, in keeping with Paul's revelation, "mysterious" aspect. For many millennial literalists, the elevation of the elect was always a component of end-times theology. Darby's almost mathematical system of dispensationalism and Biblical analysis lent his prophetic system the authority of scientific rigor, while maintaining the otherworldly and wondrous aspect of the Pauline prophecy.

Darby's rapture scheme became the dominant blueprint for Christian fundamentalist end-times prophecy throughout the twentieth century. He would be the last major British Christian apocalypticist to transplant his millennial and Biblical

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[50] See Boyer, *When Time Shall Be No More*, pp. 86-90.
[51] George M. Marsden. *Fundamentalism in American Culture*. Oxford: Oxford University Press, 1980. p. 46.
[52] For the implication of the American Civil War on American millennialism see Tuveson, *Redeemer Nation*.

extraterrestrialism to American shores. The century to come would see no abatement in extraterrestrial fantasy inspired by Christian scripture and prophecy in America. However, such fantasy was increasingly the province of aeronautical and astronautical utopians who promised a material and technological version of the rapture. Many of the most renowned proponents of twentieth century extraterrestrial millennialism in the United States would be, like Darby, imported from the British Isles. Authors, philosophers, and scientists such as J.D. Bernal, Arthur C. Clarke, and Freeman Dyson would find warmer welcomes for their spaceflight dreams on the left side of the Atlantic.

The orientation of nineteenth century American Protestantism was no more or less heaven-bent than earlier Christian incarnations. What separated the prophetic and apocalyptic beliefs of the Mormons, Adventists, and later Darbyite fundamentalists from the beliefs of the seventeenth century English millennialists, was that their beliefs were formulated in an era of increasing astronomical and mechanical sophistication. The Earth was being traversed and conquered by railroads and steamboats, and the United States was the scene of human mobility on an unprecedented scale. At the same time, with the increasing sophistication of explosives and weaponry, armaments were becoming more destructive and warfare becoming more 'total' with civilians increasingly the victim. It was no historical accident that a rising sense of apocalypticism arose in this climate for a simple reason: technological development itself was propelled by engineers and scientists who believed in the imminent end of the world. Both apocalyptic fundamentalism and modern technology fed off of each other. Fundamentalists saw technology as a sign of the end-times; many engineers and scientists saw the discovery and manipulation of nature's laws as a prerequisite to the time of Revelation. As in a spiral, industrialization and mechanization resulted in an increased apocalypticism, and the increased fervency of end-times rhetoric created an ever more urgent atmosphere for

the immediate creation of both ameliorative and end-times hastening technologies. The rocket was born in this context, and in an atmosphere in which vertical travel into the cosmos began to seem as likely as horizontal travel across the continents.

However, the dream of rocketry was not born in the United States, but in Europe and Russia. Perhaps in the United States the culture was too heavily focused on the spiritual promise of heavenly deliverance, for in Europe, where secularization has always been more powerful, spaceflight and space colonization soon became a fantasy divested of explicitly Christian doctrine but rife with the hierarchical, apocalyptic and escapist overtones of Biblical ascension. In Europe, the imagination of a mechanical ascension took hold at the end of the nineteenth century, and first in Russia, a nation undergoing the most radical break between an agrarian, Earth-centered past and an industrial future. There, an eccentric Moscow librarian by the name of Nikolai Federov began formulating a complex and bizarre pro-technological and extraterrestrialist philosophy influenced by the apocalyptic aspects of Russian Orthodoxy. His philosophy, Projectivism, would be of no concern to us if Federov's most beloved student was not Konstantin Tsiolkovsky, the first man in the history of the world to formulate workable plans for the construction of the rocket.

# 2: Heaven's Empires: The Rocket in Soviet Russia and Nazi Germany

## THE RUSSIAN ROOTS OF ROCKETRY

> Were it not for the spoiling of the air inside the rocket, and lack of food, there would be nothing to prevent us from ending our lives peacefully and happily in ethereal isolation.[53]

"Apocalypse," the Russian critic Nicolas Berdyaev wrote, "has always played a great part among the masses of our people and at the highest cultural level among Russian writers and thinkers." Russia's tradition of millennial fervor, the product of a powerful state-sponsored church and a pervasive tradition of rebellion, is found not only in the nation's devout but also in her most esteemed technologists. Indeed, Russia possesses an older and more powerful millennial tradition than even the United States. "In our thought," Berdyaev continued, "the eschatological problem takes an immeasurably greater place than in the thinking of the West and this is connected with the very structure of Russian consciousness."[54]

The first legitimate plans for rocket-powered spaceflight were not the product of an American, or even an ex-Nazi German, but of a Russian schoolteacher. Konstantin Tsiolkovsky (1858-1935) never lived to see his plans for rocket travel realized, and his papers on the subject were left untranslated into English until well after his death. Nevertheless, Tsiolkovsky became a highly popular thinker in the Soviet Union in the 1920s, and his ideas influenced the "father" of the Soviet space program, Sergei Korolev.

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[53] Konstantin Tsiolkovsky. "Beyond the Earth's Atmosphere," in *The Science Fiction of Konstantin Tsiolkovsky*. Adam Starchild, ed. Seattle: University Press of the Pacific, 1979. p. 442.

[54] Nicolas Berdyaev. *The Russian Idea*. New York, 1948. p. 193. Also see David G. Rowley. "'Redeemer Empire': Russian Millenarianism," in *The American Historical Review*. Volume 104, No. 5. December 1999.

Historian Michael Holquist has gone sor far as to claim that "[W]ithout Tsiolkovsky, there would have been no Soviet space program."[55]

Born a century prior to the launch of Sputnik, Tsiolkovsky was for most of his life an impoverished mathematics teacher in the Ryasan region of Russia, and considered a harmless eccentric by those in his community. With an absent father, a mother who died when Konstantin was very young, and little to no hearing, Tsiolkovsky overcame many impediments and managed to self-educate himself. His pioneering achievements in the field of rocketry, given his background, remain nothing short of extraordinary. He was the first theorist to understand the physics behind rocket travel in a uniform field of gravitation; he was the first to come up with the idea of powering rockets through a combination of liquid oxygen and liquid hydrogen; he was the first to understand how gyroscopes could be used to stabilize rocket ships in the low-gravity conditions of outer space. And he was the first man to conceptualize modern space stations and schemes for space colonization. Prior to Tsiolkovsky, the region beyond the Earth's atmosphere was typically not even considered a "region." It was beyond inaccessible, and to most, space was as conceptually distant as heaven. Tsiolkovsky was one of the first individuals to conceive of heaven as future real estate. The source of Tsiolkovsky's passion and genius for spaceflight lies in the metaphysical influence of one particular individual: his mentor, the Russian millennialist philosopher Nikolai Federov (1828-1903).

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[55] Michael Holquist. "The Philosophical Bases of Soviet Space Exploration," *Key Reporter*, Winter 1985-86. p. 3. Other scholars maintain that Tsiolkovsky's influence on Soviet space successes in the twentieth century was deliberately exaggerated by the Soviet regime for propaganda purposes in much the same way that the importance of Robert Goddard's rocketry experiments were exaggerated by NASA officials. It is more accurate to say that without the contributions of ex-Nazi rocketeers to both the U.S. and Soviet space programs, the achievements of both nations would have been delayed. However, Tsiolkovsky was formulating complex theories and calculations regarding rocketry at an earlier period than anyone in the United States and Soviet Union, and while many of his technical (and metaphysical) assumptions have turned out to be erroneous, his ideas profoundly influenced Hermann Oberth in Germany, and set the stage for the refinement of Soviet rocket technology after the Second World War.

Tsiolkovsky met Federov in Moscow in the 1870s. Federov, an expert on scientific literature and a librarian at what would later become the Russian State Library, was known as an eccentric but kind-hearted philospher who often gave away all his possessions, and ate only the most basic of meals. His lineage encompassed the furthest poles of Russian existence. He was the illegitimate son of an unknown peasant woman and Prince Pavel Ivanovich Gagarin, a relatively obscure member of an ancient Russian aristocratic family.[56] Fedorov was, like Tsiolkovsky, self-educated.

By 1864, Federov had already worked out the main contours of his mystical philosophy. This system of thought, which he dubbed "the philosophy of the common task," derived from deep roots in Russian apocalypticism. His central idea was that humanity was the highest form of life, and that through technology, humanity was becoming responsible for the complete regulation of the natural world. In developing technology into godlike realms, believed Fedorov, mankind was thus fulfilling God's will, helping to avert the threatened apocalypse in the Book of Revelation, and freeing mankind from the whimsical tyranny of Nature. Furthermore, Federov believed that the Earth was not the natural abode of man, but instead that the entire cosmos was man's province.

Fedorov's philosophy maintained that mankind was the consciousness of nature. Nature believed Fedorov was blind, chaotic, and deadly. All things perished. Earthquakes, fierce storms, plagues, gravity -- all of these elements of nature tended toward disintegration and death. Only humans, having transcended their animal roots, possessed of consciousness, could reverse or slow the hideous effects of this global tragedy, this consistent running down of the world, this flight toward entropy. Only

[56] George M. Young, Jr. *Nikolai F. Federov: An Introduction*. Belmont, Mass.: Nordland Publishing Company, 1979. p. 17.

humans, with technology, could reverse this sick process. Humanity was God's instrument in a pitched battle against nature's chaos. For Federov, death was the ultimate evil. Man needed to strive for life and light, and away from darkness and death. Through technology, believed Federov, death could be utterly defeated.

It was for this reason that Fedorov believed that it was the common task of all humanity to bring back life to those who had died. Federov believed that the technology to resuscitate the teeming hordes of humanity that had perished should replace those technologies currently going towards armaments and weaponry. The task of resurrecting the dead, believed Federov, would become the moral equivalent of war.

Federov felt that mankind would soon be morally obligated to give life back to deceased ancestors so that they might walk the Earth again and teach humanity the wisdom they learned in the past. Each generation of resurrectees would resurrect older and older ancestors with whom they were acquainted, until no one who ever lived would remain dead. "With each new person resurrected knowledge will be growing," Federov claimed, "It will reach the height of the task just when the human race arrives at the first person who died."[57] Science and exploration, instead of seeking obscene wealth, would focus on gathering ancestral remains, long since scattered atomically throughout the solar system and beyond, in order to put them back together again. This project of resurrection would fulfill God's desire for human development, and Fedorov believed that someday man would so increase his powers that he would stand and greet God "face to face," as equals. Man, through resurrection technologies and through the complete and utter control of nature, would become God.[58]

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[57] Cited in Young, p. 105.
[58] Young, p. 15.

Federov's views on space travel were tied directly to his resurrection imperative. In order that the atomic remains of the ancestors could be gathered back together so that the process of resurrection could occur, mankind was to develop extraterrestrial technologies. In turn, to ease the population burden that the resurrected would cause on Earth, new habitable planets needed to be discovered for their resettlement. This would be the ultimate fulfillment of Biblical prophecy for Federov. "The awaited day, the day longed for through the ages, the jubilation of the immense heavens, having swallowed generations in darkness, moved and directed by heavenly filial love and knowledge," Federov claimed, "will begin to return those swallowed to her and with them begin to populate the heavenly, starry worlds that are now without souls…"[59]

While Federov's ideas may seem extremely idiosyncratic, in the late nineteenth century, with the rapid achievements in communication and transportation technology then being introduced into Russia, such fantastic dreams did not seem so far off. Federov's philosophy represented a hopeful synthesis of Russian Orthodox apocalypticism and nineteenth century technological utopian exuberance. Indeed, Federov's views were popular in Russia throughout the twentieth century, and he counted among his admirers Fyodor Dostoevsky, Leo Tolstoy, Boris Pasternak, and as one scholar has claimed, even Leon Trotsky and Josef Stalin.[60]

Tsiolkovsky also became enamored of Federov's utopian ideas. Tsiolkovsky's writings, like Federov's, were never solely, or even primarily technical. He wrote books on religion, ethics, and morality, all influenced by the apocalyptic Federovism he had learned from the philosopher. Many of his theories about space colonization were direct extrapolations from Federovian philosophy. While Federov saw space colonization as a

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[59] Cited in Young, p. 106.

[60] Dmitry Shlapentokh. "Bolshevism as a Federovian Regime," *Cahiers de Monde Russe*, XXXVII (4), October/November 1996. pp. 429-466.

major part of his philosophy for universal resurrection, Tsiolkovsky worked out the practical details of its fulfillment.

Tsiolkovsky and Federov occupy a central position in the transition from Christian millennialism to twentieth century secular extraterrestrial millennialism. Federov and Tsiolkovsky were religious literalists. The Book of Revelation was an actual prophecy of future events; the symbology of the Christian drama was for Federov actual and material, not conceptual or psychological. In the late nineteenth century world of seemingly magical innovations, Tsiolkovsky and Federov believed in the materialization and technologization of Christian eschatology and cosmography. While their writings retain traditional Russian Orthodox imagery, language, and assumptions, the two extraterrestrial thinkers translated Biblical eschatology into the new extra-geography of outer space. Tsiolkovsky's works reveal how traditional forms of Christian millennialism evolved into a technological and extraterrestrial millennialism in the twentieth century. His writings bridged the linguistic gap between the heavenward religious yearnings of the devout, and the spacebound secular and technological yearnings of the twentieth century astro-technophile. The extraterrestrial millennialist beliefs which would become common among rocketeers, astronauts, and space enthusiasts in the twentieth century have their analogues in Christian Revelation. The conviction that apocalyptic events are imminent, yet can be avoided by an elect and chosen group of believers, is the Rapture made technological; the belief that the true home of mankind is not on Earth but in outer space is the desire to enter the Heavenly City made material; the belief that human expansion into space will result in a form of "higher" evolution is the perfection of mankind post-millennium; the belief that spaceflight is an undertaking entered into on behalf of all mankind is the zeal of the techno-missionary; and the belief that life, in the form of mankind, must be spread

throughout the universe is the fulfillment of divine exhortations to "be fruitful and multiply," as well as the analogue to the missionary impetus of Christian dogma. All of these elements appear time and time again in Tsiolkovsky's writings.

Tsiolkovsky's utopia in space had much in common with the extraterrestrial dreams of Isaac Newton, who had envisioned the self-willed flight of the post-millennial "children of the resurrection." Like Newton's imagined angelic super-humans, Tsiolkovsky's future humanity would float freely in the blissful zero-gravity of space. In his novel *Outside the Earth*, Tsiolkovsky imagined the sensation of astronauts upon their return to Earth. The planet they return to is free of the utopian joy Tsiolkovsky ascribed to weightlessness:

> …[T]he Earth was somehow different… More than anything, it seemed cold, damp; then arms, legs, the whole body seemed filled with lead… The air, encumbered with nitrogen, seemed to be stifling them… Next day, many of them were in the grip of colds. Some went down with influenza… The Sun had no warmth; it shone sluggishly. The sky was too cloudy; at night, the stars were far away, too few and too faint… the dome of heaven was a flat roof above them. An unpleasant smell pervaded everything. Food seemed tasteless; people looked clumsy in their clothes; furniture revolting; gravity seemed unbearable…[61]

Tsiolkovsky's space dwellers do not just feel angelic; his descriptions anticipate an actual future evolution of man towards angelhood. He imagined a cherubic and intellectually rich life in the firmament: "Clothing, footwear, and fuel will become superfluous… The bashful will wear light clothes… The height of man, and hence, his brain and mental capacity may increase considerably."[62] Further in the future, Tsiolkovsky believed, men would evolve into angels. "A most perfect type of organism

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[61] K.E. Tsiolkovsky, *Beyond the Planet Earth*. Translated by Kenneth Syers. New York: Pergamon Press, 1960. pp. 187-88.
[62] K.E. Tsiolkovsky. "Beyond the Atmosphere: A 1923 Essay," in *Spaceflight*. c.1966. NASA History Files.

would dominate space," Tsiolkovsky wrote. "An organism that lived in ether and received its nourishment directly from solar energy…

> [T]heir skin is covered with a glassy film, a rather soft and thin one, but absolutely impervious to gases, liquids, and other volatile bodies and it therefore keeps them from suffering any material losses. There are no external openings in their bodies; the natural cycle of gases, liquids and dissolved solid matter takes place within the being, and not via any external medium. The surface of the body, with its small winglike appendages, lighted by the Sun, serves as a laboratory to generate strength and life.[63]

Tsiolkovsky's future humanity would be translucent, white, winged, sexless, perfect beings – angels made ultimately possible through the rocket equations he was then formulating.

Superhuman evolution was not the only translation of Christian eschatology into futuristic technology that Tsiolkovsky envisioned. In place of God, Tsiolkovsky imagined the existence ofa higher extraterrestrial civilizations. He believed that the Earth was monitored and visited by these civilizations, but because humanity was so far behind in evolution, these beings went unrecognized. Humanity, Tsiolkovsky thought, might be in a celestial quarantine or zoo, with human evolution being guided so that one day humanity would replenish their angelic numbers, thus bringing them "a new and wonderful stream of life that will renew and supplement their already perfected life."[64]

Tsiolkovsky's millennial dreams of populating heaven with a rocket-propelled humanity replete with zero-gravity nudity and angelic perfection was classical Christian utopianism translated into outer space. And the darker side of Christian eschatology also found its way into Tsiolkovsky's extraterrestrial millennialism. Just as the Christian heaven was not for everyone, but only for the most perfect believers, Tsiolkovsky saw in

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[63] K.E. Tsiolkovsky, "Dreams of Earth and the Sky," in *The Science Fiction of Konstantin Tsiolkovsky*. Adam Starchild, ed. Seattle: University Press of the Pacific, 1979. p. 98; this translation cited in Yuri Shkolenko, "From Ethereal Settlements to Space Islands," in *Soviet Life*. April 1979. p. 44-46.

[64] Cited in Vladimir V. Lytkin, "Tsiolkovsky's Inspiration," in *Ad Astra*. November/December 1998. p. 38.

space exploration a chance to propel human evolution away from inferior life forms towards a more superior genetic future amongst the stars.

Tsiolkovsky took Federov's "common task," the resurrection of the deceased, and through it envisioned the ultimate perfection of all life. The logic of Tsiolkovsky's plan revolved around his belief that human consciousness was composed of atoms which were scattered across the universe. These divine atoms were concentrated in humans, and lived on after the death of the individual, but became scattered. The "common task" of humanity was to collect these divine atoms and reorient them towards consciousness. These atoms, however, were not just lying around in the dust. They were often present in other creatures, mostly those not possessing consciousness. It was humanity's goal and responsibility, believed Tsiolkovsky, to reorient these atoms into a "perfect community" and this would necessitate the elimination of those forms of life deemed inferior.[65]

Tsiolkovsky's beliefs concerning human evolution were sinister in another respect. Both Federov and Tsiolkovsky believed strongly that the military was the highest form of human order. Both saw technocratic organization as the most evolutionarily perfect system of humanity. Anticipating the technocratic totalitarianism of Soviet Communism, and resembling the technocratic utopianism of American Taylorism, Tsiolkovsky envisioned a collective effort towards the mastery of nature and human expansion into space. Volunteer armies, millions strong, would work together to utterly transform the Earth, dominate nature, and engage in the Federovian "common task." Without volunteers, Tsiolkovsky did not object to the use of coercion to compel workers to engage in the effort.[66]

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[65] Vladimir V. Lytkin, "Tsiolkovsky's Inspiration," in *Ad Astra*, November/December 1998. pp. 37-38.; Shlapentokh, p. 440.
[66] Dmitry Shlapentokh. "Bolshevism as a Federovian Regime," in *Cahiers du Monde russe*, XXXVII (4), October/November 1996. p. 441.

Both Tsiolkovsky and Federov believed that no nation except a manly Russia could effect the massive resurrection imperative. A manly Russia would be the beacon leading the world towards a technological utopian future. According to Russian historian Dmitry Shlapentokh, Federovian and Tsiolokovskian beliefs came to pervade Bolshevism, in no small part due to the popularization of the two men's extraterrestrial millennialist ideals.[67] Tsiolkovsky, then, the earliest and one of the most influential figures in the history of rocketry was more metaphysicist than engineer. His metaphysics – his moral cosmography, his disdain for the imperfections of Earth, his desire to engineer humanity into gods, his corollary desire to weed out imperfections in human and animal evolution, and his explicit belief in the desirability of total human resurrection – were all products of a late nineteenth and early twentieth century technologically utopian form of Christian millennialism. Like Newton, Tsiolkovsky longed to soar in heaven as a transformed angelic being; unlike the great astronomers, he walked the Earth in an era when the means of leaving the planet first began to seem technologically feasible.

Behind all of Tsiolkovsky's dreams for spaceflight lay the ancient Christian disdain for the Earth. At various points in his writings, he described the planet as "cursed and banal," a "pea-Earth," "cruel," and "clumsy." On Earth, he wrote, "walls topple down, old buildings are demolished by gravity and even mountains crumble away…" Humans, he maintained, suffer from living on Earth. "[A] man may stumble into a pit and hurt himself," he states at one point, and on another occasion he claimed that "people could not slip and fall or slip and break their bones" in space. On Earth afflictions such as "bedsores," "numb" legs and arms, and frality were common but not in space.[68] On one rare occasion, Tsiolkovsky has one of his fictional characters – a "doubter" of space

[67] Ibid, p. 440-41.
[68] See Adam Starchild, ed. *The Science Fiction of Konstantin Tsiolkovsky*. Adam Starchild, ed. Seattle: University Press of the Pacific, 1979.

based living -- lament the space environment. In space, the doubter cries, one is unable to "have the pleasure of a stroll on foot" and lacks the joy of viewing terrestrial scenery: "…[E]verything is so monotonous, and the black sky and the lifeless stars are dreadful. Here I can see the blue sky, the glorious sky, the lovely colours of the air, hills, valleys and woods. A medley of sounds caresses the ear wherever you go. What can be better than a thunderstorm in spring, the babble of a brook, the murmur of trees, the pounding of the surf on the beach…" Tsiolkovsky, who was deaf, and could not, in any case, easily discern babbles, murmurs or poundings, has his fictional space advocate ready with a quick retort. "But how many people have the time and opportunity to enjoy them? On the other hand, in the greenhouses there will be flowers, fragrance and beauty galore… A tired, work-weary person cannot take in the beauties of nature. Enlightenment and association with large numbers of people will be a great recompense for the absence of terrestrial romance."[69] By 1935, the year of his death, Tsiolkovsky had begun to become a Soviet celebrity. In a short article he wrote for the *Komsomolskaya Pravda* that year, he reiterated his joy at dreaming of an existence freed from the Earth. "What can be more splendid," he wrote, "than to find an outlet from the tight little corner of our planet, to be in close communication with outer space and to give people a way out of the cramped position on the Earth and a chance to throw off the shackles of gravity!"[70]

Tsiolkovsky's personal desire for zero-gravity, as well as his utopian beliefs concerning rocketry, were mimicked in the belief systems of the rocketeers who followed him. As James Hartford wrote in his biography of the Soviet rocketeer Sergei P. Korolev, "In simple fact, Korolev began to build what Tsiolkovsky had conceived."[71]

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[69] "Outside the Earth," *The Science Fiction of Konstantin Tsiolkovsky*. Adam Starchild, ed. Seattle: University Press of the Pacific, 1979.p. 267.
[70] Konstantin Tsiolkovsky. "Is This Mere Fantasy?" Reprinted in *The Science Fiction of Konstantin Tsiolkovsky*. Adam Starchild, ed. Seattle: University Press of the Pacific, 1979. p. 455.
[71] James Hartford. *Korolev*. New York: Wiley, 1997. p. 14.

## THE GERMAN AND NAZI ROCKETEERS

> How were we able to drink up the sea? Who gave us the sponge to wipe away the entire horizon? What did we do when we unchained this Earth from its sun? Whither are we moving now? Away from all suns? Are we not plunging continually? Backward, sideward, forward, in all directions? Is there any up or down left? Are we not straying as through an infinite nothing? Do we not feel the breath of empty space? Has it not become colder?[72]
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> Nazism had been an assault upon the cosmos… Was space its amputated limb, its philosophy in orbit? -- Norman Mailer, *Of a Fire on the Moon*, 1969.

While Federovian millennialism would appear in a secular guise under the Soviet regime, similar extraterrestrial beliefs arose in Weimar and Nazi Germany. Like the Soviet Union, Germany was a nation imbued with technological optimism and Christian apocalypticism, thus providing fertile ground for the development of a similar form of rocket-inspired transcendence.[73] At the same time, both the Soviet Union and Nazi Germany began to differentiate between a state-sponsored nationalist and technocratic millennialism and the older metaphysical millennialism of traditional Christianity. The Nazi hierarchy sought to supplant Christianity with a Germanic pagan state-sponsored faith, and thus eliminate the influence of the churches in politics. By the end of World War Two, only Hitler held more political power than Martin Bormann, who served as private secretary to the Fuehrer until the very end. “National Socialist and Christian concepts are incompatible,” wrote Martin Bormann in 1942. “The Christian Churches build upon the ignorance of men and strive to keep large portions of the people in ignorance," Bormann continued, "On the other hand, National Socialism is based on

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[72] Friedrich Nietzsche, *The Gay Science* (1882, 1887) para. 125; Walter Kaufmann ed. (New York: Vintage, 1974), pp.181.

[73] See Michael Neufeld. "Weimar Culture and Futuristic Technology: The Rocketry and Spaceflight Fad in Germany, 1923-1933," *Technology and Culture* 31 (October 1990). pp.725-752.

scientific foundations… Our National Socialist worldview stands on a much higher level than the concepts of Christianity which in their essentials were taken over from Judaism. For this reason, too, we can do without Christianity."[74] What remained constant in both Nazi Germany and Soviet Russia was a millennial ideology divested of explicit Christian imagery but symbologically consistent with Scripture. As Nicholas Goodrich-Clarke has remarked,

> Semi-religious beliefs in a race of Aryan god-men, the needful extermination of inferiors, and a wonderful millennial future of German world-domination obsessed Hitler, Himmler, and many other high-ranking Nazi leaders… The Nazi crusade was essentially religious in its adoption of apocalyptic beliefs and fantasies, including a New Jerusalem and the destruction of Satanic hosts in a lake of fire. Auschwitz, Sobibor, and Treblinka are the terrible museums of the twentieth-century Nazi apocalyptic.[75]

The "Thousand-Year Reich" envisioned by the Nazi elite would be a millennium without Christ or Yahweh, under the direction of highly evolved and chosen Aryan men.

Most historical treatments of Nazi rocketry downplay the Reich's enthusiasm for space travel.[76] It is true that as soon as Hitler took power, the independent rocketry groups in Germany were quickly disbanded and their members absorbed into the military. It is also true that the dominant reason for the construction of rockets was to terrorize farflung populations and perhaps one day threaten to deliver an atomic bomb. Hitler himself was profoundly uninterested in the utopian dreams of the rocket enthusiasts. In one of his few recorded comments on spaceflight, Hitler evinced his pessimism. "At the end of the last century the progress of science and technology led liberalism awry into proclaiming man's mastery over nature, and announcing that he would soon have

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[74] Martin Bormann, "National Socialist and Christian Concepts are Incompatible," in *Nazi Culture: Intellectual, Cultural and Social Life in the Third Reich*. George L. Mosse, ed. New York: Grosset & Dunlap, 1966.
[75] Nicholas Goodrick-Clarke. *The Occult Roots of Nazism*. New York: New York University Press, 1992.
[76] See Frank H. Winter. *Rockets into Space*. Cambridge: Harvard University Press, 1990; Michael Neufeld, *The Rocket and the Reich*. Cambridge: Harvard University Press, 1995.

dominion over space," Hitler said. "But a simple storm is enough – and everything collapses like a house of cards." Technological utopianism was not strong in the Fuehrer.[77]

Yet the first men to develop modern long-range rockets were almost all Nazis or fervent German nationalists. Hemann Oberth, a member of the German ethnic minority in Romania, was strongly committed to German imperialism before, during, and even after the fall of the Reich.[78] Wernher von Braun, the Nazi rocketeer later smuggled into the United States to develop the American ballistic missile program, was a decorated SS officer. Rudolf Nebel, a key figure in the early funding of rocket experiments, was associated with the ultra-right wing German National People's Party prior to the war, and a fervent supporter of the Nazi regime.[79] After 1945, many of the Nazi rocketeers were appropriated for the U.S. defense program through the secret Army Operation Paperclip, and an elaborate mythology concerning their motivations arose via historians associated with the German Peenemunde rocket team, which claimed that they were primarily interested in the utopian promise of spaceflight. Historians such as Ernst Stuhlinger and Frederick Ordway III were the most fervent advocates of this mythology.[80] For instance, von Braun's arrest late in the war was often characterized as punishment for his utopian spaceflight ideology. As historian Michael Neufeld has noted, in his excellent book, *The Rocket and the Reich*, this mythology was false, designed to make the incorporation of

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[77] Hugh Trevor-Roper, *Hitler's Secret Conversations 1941-1944* New York: Farrar, Straus and Young. 1953. p. 5.

[78] Michael Neufeld. "The Excluded: Hermann Oberth and Rudolf Nebel in the Third Reich," *QUEST*, Vol. 5, No. 4. Winter 1996. pp. 22-27.

[79] Ibid.

[80] See Frederick I. Ordway III and Mitchell R. Sharpe. *The Rocket Team*. New York: Thomas Y. Crowell, 1979; Ernst Stuhlinger and Frederick I. Ordway, III. *Wernher von Braun: Crusader for Space*. Malabar, Florida: Krieger Publishing Company, 1994; Wernher von Braun, Frederick I. Ordway III. *The History of Rocketry and Space Travel.* New York: Thomas Y. Crowell, 1986. Also see Marsha Freeman. *How we Got to the Moon: The Story of the German Space Pioneers*. Washington, D.C.: Twenty-First Century Associates, 1993.

Nazis into a patriotic American space program palatable to the public. Von Braun's arrest, in fact, had more to do with tensions within the Nazi military than with his commitment to spaceflight.[81]

Despite the Nazi regime's lack of enthusiasm for extraterrestrial utopias, there are intriguing links between Nazi millennialism and extraterrestrial millennialism. Both emerged from Christian eschatological roots. And both, in Germany, benefited from a pervasive German nationalism, evidenced by the pro-Nazi sentiments of the Reich's rocketeers. The ways in which Nazi ideology and extraterrestrial millennial ideology were philosophically allied can perhaps best be glimpsed in the writings of the Reich's chief architect of cultural policy, Alfred Rosenberg.

The desire to create Earth-transcending rockets was an easy extrapolation from Nazi cosmological, spatial, and racial thought. According to Rosenberg's racial ideology, the German nation and the Nordic peoples who made up its collective soul were people of the transcendent -- a race of men concerned with the eternal beyond and with the existence of an "oversoul." By contrast, the Jewish people, and other groups who the Nazis saw as inferior and dangerous, such as homosexuals, gypsies, and Slavs, were people of the "Earth," peoples with no eternal soul. A close reading of an essay by Rosenberg reveals this imagined cosmological dichotomy. Through Rosenberg's words, we can glimpse the outlines of an ideology of Earth escape, Earth disdain, and genocidal ambition.

"Let us repeat once more, and again and again," Rosenberg begins, "the most important point that has been made up to now: the Jewish religion completely lacks the belief in a supra-sensible Beyond... The Jews, with their religion oriented to purely earthly affairs, stand alone in the world." For Rosenberg, the supposed Jewish lack of

[81] Michael Neufeld. *The Rocket and the Reich*. Cambridge: Harvard University Press, 1995. p. 219.

concern for an afterlife represented a soullessness which threatened to destroy the world. The Jews, according to Rosenberg, were the only people that possessed a "totally pure" form of "world-affirmation" without "any admixture of world-denial." In other words, the Jewish people accepted the state of the world and did not seek to transcend it, did not seek to place their faith in a "supra-sensible Beyond." The Jews were, according to Rosenberg, profoundly disinterested in the Christian promise of heaven. This pure form of world-affirmation was extremely dangerous, Rosenberg believed, because if the people of Earth did not seek to deny the influence of the world, "the inner light" -- the belief in immortality -- would be snuffed out, and mankind "would be lost forever to the terrestrial world."[82]

Rosenberg believed quite confidently that "it seems as if the inner light has completely vanished from this earth." Yet this inner light could never completely go out because it "is part of the soul of mankind and the soul is immortal." However, Rosenberg goes on to say, if "the Jewish people were to perish, no nation would be left which would hold world affirmation in high esteem." For Rosenberg, the end of the Jewish people meant the end of time itself, the fulfillment of Biblical prophecy. For Rosenberg, the end of time was not a bad occurrence. Indeed, the very concept of an eternal thousand-year Reich anticipates a millennial and timeless epoch of peace and plenty -- without Jews.

The idea that the Jews were an "earth-centered" people, whereas the Nordic or German race were sky-centered, or hereafter-centered, helps explain in a broad way the cultural and religious bases for the German nation's pioneering development of rocket technology. This is not because rocketry was explicitly connected to any particularly anti-Semitic ideology, but because the German self-conception and state spirit under Nazism saw the Earth as an abode of man separate and separated from God. Just as

[82] Alfred Rosenberg, "The Earth-Centered Jew Lacks a Soul," in *Nazi Culture*, pp. 75-76.

Newton saw his work as part of an effort to bridge the gap between an earthbound humanity and a transcendent extraterrestrial God, the Nazis saw their racial policies and extermination camps as the means by which pure Aryans could separate themselves from the depraved races of Earth. Since the Jews supposedly did not feel this separation, or at least did not envision it as wide a gap as traditionally Christian nations did, the Jews were "Earth-centered" and terrestrial. The Jews, according to Rosenberg and other Nazis, were an evil affliction of the world, the breeders of modernist, existentialist, and degenerate ideas which threatened to extinguish the idea of heavenly transcendence from the world once and for all.

"Their aim is to strip mankind of its soul," Rosenberg went on to assert. "For as arch-materialists it is their insane opinion that it is precisely the spiritual, which they sense only obscurely, that is connected with the form as a matter of life and death and must perish with it... In fact, they cannot be anything else but opponents of order and law, because order and law, in a unique way, bear the radiant imprint of a purer world."[83] While Rosenberg's writings hint at the cosmographical roots which gave rise to a faith in rocketry simultaneous to the rise of Nazism, it is the belief systems of four key figures in the German spaceflight movement – Max Valier, Hermann Oberth, Wernher von Braun and Krafft Ehricke – which offer perhaps the best glimpse into the technological utopian and extraterrestrial millennial aspects of the development of rocketry in Nazi Germany.

[83] Alfred Rosenberg, "The Earth-Centered Jew Lacks a Soul," in *Nazi Culture*, p. 78. William Sims Bainbridge notes that "Jews did not have a great role to play in the Spaceflight Movement," and that Jewish rocketeers were a rarity. Bainbridge neglects to mention Theodore von Karman, who was a Hungarian Jew who escaped in time.

**Hermann Oberth**

Of all the German rocket pioneers, Hermann Oberth was the most influential. A sort of Germanic version of Tsiolkovsky, Oberth was a crotchedy and icy Romanian-born physics teacher who had obsessed over spaceflight since childhood. Like Tsiolkovsky, Oberth devoted himself to calculating escape velocities, the effects of weightlessness, and the utopian promise of spaceflight. Both rocket pioneers were more visionary than engineer, and both inspired others in their nation to dream of spaceflight and construct the rockets necessary to make the fantasy a reality.

Oberth's book, *The Rocket into Interplanetary Space* is widely credited with launching the German spaceflight craze of the 1920s.[84] With the help of rocket pioneer Max Valier, Oberth organized the Society for Space Travel, and thus created the nucleus of the Nazi rocket group that developed the V2 rockets that rained on London late in the war. As scientific and technical adviser for Fritz Lang's 1929 science fiction movie, *Frau im Mond* (Woman in the Moon), Oberth's ideas and terminology surrounding rocket-powered spaceflight fully entered the public realm.

In his 1929 book, *Ways to Spaceflight*, Oberth expressed the technological utopian and extraterrestrial millennialist disdain for inferior cultures. In refuting Oswald Spengler's pessimism regarding the future of mankind, Oberth wrote, "I believe that once humanity has reached the point where we are, it will no longer become extinct at all.

> Through science it will find ways and means to redress all threats of harm. With sharp observation we notice a number of indications of that. (For example, the

[84] See Michael J. Neufeld. "Weimar Culture and Futuristic Technology: The Rocketry and Spaceflight Fad in Germany, 1923-1933." in *Technology and Culture*, Vol. 31, #4. October 1990. pp. 723-52.

> movement for race hygiene, for biologically and hygienically correct living, for moral purity of public life…)[85]

Both Tsiolkovsky and Oberth saw their spaceflight pursuits in a missionary light. They were not just trying to solve a technical problem. They saw their labors as part of an altruistic endeavor to achieve human salvation. Federov, for instance, in seeing human action in the cosmos as essentially purposeful, believed that the apocalypse in the Book of Revelation was not inevitable, but rather a possible future. In formulating ways to escape the planet, both Tsiolkovsky and Oberth were attempting to engineer an escape from the apocalypse and an escape from man's baser nature through planetary transcendence and directed human eugenics.

Oberth's extraterrestrial millennialist missionary zeal became most pronounced after the Second World War. With little practical technical training to supplement his ultra-nationalist spaceflight ideology and theoretics, Oberth's services were marginal to the Nazi regime's Peenemunde rocket program and he languished in obscurity until the launch of Sputnik. His book *Man into Space* (1959) proclaimed that the goal of spaceflight was missionary in character ("This is the goal: To make available for life every place where life is possible. To make inhabitable all worlds as yet uninhabited, and all life purposeful."), but gave little hint as to the direction of his beliefs in the 1960s. Instead of aligning himself with the engineers employed in the space race between the United States and the Soviet Union, Oberth allied himself with UFO abductee and psychic groups, participating in numerous conferences on the subject. In the mid-fifties, Oberth penned an article in which he claimed that "flying saucers are real and… they are space ships from another solar system…

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[85] Hermann Oberth. *Ways to Spaceflight*. NASA Technical Translation F-622. Washington, D.C.: NASA, 1929 (1972.) p. 543.

> I think that they are possibly manned by intelligent observers who are members of a race that may have been investigating the Earth for centuries… It is my theory that they are directed by living beings from another solar system, or more than one other solar system, and I call this race of visitors 'Uranides.' I have taken the liberty of making up the word from the Greek word for heaven, 'ouranos.'… Perhaps they can disclose to us secrets that otherwise we might not lay bare in a hundred thousand years.[86]

The "Uranides" would inspire Oberth to write two books, full of material culled from the psychic channellings of a woman by the name of Barbara Troll. Troll contacted Oberth shortly after the rocket pioneer "outed" himself as a UFO believer, and claimed that she had been contacted by a higher race of extraterrestrials. The Uranides had instructed Troll to pass along important information to Oberth.

In *Primer for Those Who Would Govern* (1984), a book inspired by decades of Uranide advice, Oberth advocated the same extraterrestrial millennialist dogma espoused by Valier and Tsiolkovsky. Oberth introduced *Primer* as "the very least anyone active in public politics should know." In it, Oberth translated Christian eschatology into twentieth century technology and astronautics, often using explicitly Christian language.

For Oberth, the threat of the apocalypse was real but could be avoided through technologically-directed ends. "…God cannot show Himself or reassure us about our final end," Oberth wrote in *Primer*. "Only when mankind is threatened with disaster… does God, through faith, give us a ray of hope, but only enough to prevent our destruction

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[86] Hermann Oberth, "The Case for the Reality of Flying Saucers," photocopy from unknown publication, NASA History Archives, Biography section. c.1955. Oberth's claim to have made up the name "Uranides" is a rather bald fabrication. German science fiction writer Hans Dominik, in 1928, penned *Der Erbe des Uranides*, a tale about a race of superior extraterrestrials called the Uranides that populate Venus and then go extinct, but not before providing Earthbound humanity with the means for interstellar travel. Dominik, along with Kurd Lasswitz, were the two most famous Weimar-era German science fiction writers, so it is doubtful that Oberth was unfamiliar with the book, or the Uranides he claimed to have named decades later. Dominik, while not a Nazi, was a committed nationalist, and one biographer claims that his "primitive" and highly popular works (published continuously to this day, even through WWII paper shortages) helped further National Socialist goals. See William B. Fischer's *The Empire Strikes Out: Kurd Lasswitz, Hans Dominik and the Development of German Science Fiction*. Bowling Green, Ohio: Popular Press, 1984.

and never so much that this faith could not again be destroyed by a future development."[87] Like Tsiolkovsky, Oberth believed that God desired mankind to engineer the species in order to prevent entropic and racial decay. The Uranides explicitly told Oberth so: "Prevent the proliferation of human parasites," they commanded. "Take care that people are not born who will constantly be a burden to those who have the ability still to save your planet."[88] Oberth, based on the Uranides' recommendations, advocated euthanasia, forced sterilization, and eugenics programs. "Whenever the opponents of eugenics point out the mistakes of former programs," Oberth wrote, "it only proves that these programs were not worked out properly, not that eugenics *per se* violates the will of God."[89] Oberth also advocated the extermination of handicapped infants.[90]

And what of genocide? Oberth recommended against it. "The reasons why genocide… is to be avoided are the following:

> 1…. [W]e cannot say whether one day a certain species could be very useful… 2. Occasionally man is successful in producing a mutation of an originally useless creature, giving us something which can be important for culture and science… 3. …[T]he existence and observation of any race can aid science as well as technical research in obtaining much important information. Most living things… would not in themselves be absolutely necessary for the continued existence of mankind…. 4. Often some species will also serve a purpose of which people are still unaware… 5. …[E]very human race… is an idea of the Creator which should at least be preserved in our memory, even if the species concerned were to have died out in the never-ending struggle for existence…[91]

Genocide is bad, Oberth believed, in an instrumental sense and only tangentially for any moral reasoning.

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[87] Hermann Oberth, *Primer for Those Who Would Govern*, West-Art Publishers, 1987. p. 28.
[88] *Primer for Those Who Would Govern*, p. 176.
[89] Ibid., p. 178.
[90] Ibid., p. 184.
[91] Ibid., pp. 181-182.

Oberth's book, written fifteen years after the first moon landing, sheds light into the deeper recesses of the mind of the rocketeer. Like Tsiolkovsky and Federov, Oberth believed that the impetus to spaceflight was in some measure guided by a higher extraterrestrial power, and that this power had in some way "chosen" a particular national group to achieve the millennial breakout into space. The parallels between rocket-inspired transcendence and the Christian rapture are too strong to ignore. Both envisioned an elite exodus into outer space and the abandonment of an Earth grown too crowded and dangerous for continued human survival.

However, Tsiolkovsky and Oberth dreamed of rocketry before the threat of nuclear war materialized. Those Germans that succeeded Oberth, and who gladly participated in the Nazi war effort, would go on to construct rockets in an age when the destruction of the Earth by fire became a technological possibility. Peenemunde rocketeers Wernher von Braun and Krafft Ehricke evinced no guilt at constructing intercontinental ballistic missiles (ICBMs) and justified their work as necessary to effecting an exodus into space.

**Wernher von Braun**

Wernher von Braun, the head of the Nazi rocket team at Peenemunde that was responsible for indiscriminately launched rockets into London's population centers, and later the spiritual and technical leader of the United States space program, claimed that Hermann Oberth was one of his primary inspirations for becoming involved in rocketry.[92]

Von Braun remains one of the most enigmatic men of the twentieth century. An SS officer under the Nazi regime, von Braun was expatriated to the United States as part

[92] The novels of Jules Verne and German science fiction writer Kurd Lasswitz were the other primary inspirations.

of the U.S. Army's Operation Paperclip, a secret World War II program designed to funnel Nazi Germany's scientists into America. Despite his affirmed Nazi roots, von Braun became a media superstar in the United States during the Soviet-American space race. He helped develop intercontinental ballistic missiles for the American military and the first American rocket, and collaborated with Walt Disney on the influential *Man in Space* cartoon series.[93]

The story of von Braun's voyage from Nazi weapons designer to American space hero was shrouded in years of official obfuscation, sycophancy, and adulatory propaganda. The mythology surrounding von Braun could never completely conceal his involvement with Nazism, but the American political and military establishment were willing to look the other way as long as he helped the United States in the space race. During the space race, NASA and most popular histories of space travel (many of them written by German émigrés and friends of von Braun) characterized him as a dispassionate pawn of the Third Reich's military-industrial complex. Von Braun always spoke of his employment at Peenemunde as a necessary evil. In an affidavit written in 1947 for the Army, von Braun downplayed his association with the SS, claiming it was an honorary commission and that he only joined the National Socialist party because if he refused, it "would have meant that I would have to abandon the work of my life."[94] There is little reason to doubt von Braun's account; the Nazi hierarchy certainly would have taken notice if their chief rocket designer professed an unwillingness to commit to the Reich.

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[93] Michael Neufeld. "German Spaceflight Advocacy from Weimar to Disney," in *1998 National Aerospace Conference: The Meaning of Flight in the twentieth Century*, Wright State University, Dayton, Ohio, October 1-3, 1998.

[94] Cited in Dennis Piskiewicz. *Wernher von Braun: The Man Who Sold the Moon*. Westport, CT: Praeger, 1998. p. 45.

However, historian Michael Neufeld has suggested that the cover von Braun used to downplay his Nazi past – that he used the Nazis to help achieve his true goal, the conquest of outer space – was disingenuous. "It is certainly true that spaceflight played a role in the thinking at Peenemunde; von Braun and a few close friends toyed with the idea in their spare time… But [von Braun] was an opportunist who had no overriding moral qualms about building missiles for the Third Reich, even when slave labor became involved," Neufeld wrote. As for the Peenemunde engineers who claimed, like von Braun, to be more interested in spaceflight than munitions manufacture, Neufeld claimed, "Spaceflight was not central to their concerns, even if they later became fascinated by it."[95] Rockets promised Earth escape, surely, but they also promised an equally fascinating Earth destruction. At the very best, von Braun remained throughout his life an individual fascinated equally with both sides of his technology's duality.

Yet if von Braun's claim of being guilty of only misdirected spaceflight utopianism was a cloak, he nonetheless did devote a significant percentage of his waking hours to promoting extraterrestrial endeavors as the last, best hope of mankind. He wrote several books on spaceflight, devoted countless hours to lecturing on futurism and space colonization, and co-founded the National Space Society, a space advocacy group still active today. Although undoubtedly an opportunist, von Braun was motivated by *something*, and a review of his writings, letters, and religious beliefs suggests that that something was an extraterrestrial and technological version of the Christian apocalyptic – what I have been calling "extraterrestrial millennialism." In his early life, this influence may have been semi-conscious, but as he grew older, the interpretive framework of Christian millennialism came to be his primary spiritual justification for his work.

[95] Neufeld, *Rocket and the Reich*, p. 219.

After arriving in the United States, von Braun became a born-again Christian. While von Braun's Christian beliefs only became public after his removal to the United States, he received extensive religious instruction as a child.[96] However, he was never known as a particularly devout Christian while in Germany, and many of his colleagues expressed surprise tinged with a bit of disappointment at the rash of religious expressions he made in the late 1960s and 1970s. After arriving in the United States, his work environments in both Texas and Alabama were hotbeds of Christian fundamentalism. Many of his colleagues at NASA, as will be discussed later, were devout Christians. While in Texas, von Braun became a born-again Christian under the influence of a local Nazarene minister.[97]

Until his death in 1977, the German rocketeer repeatedly and fervently declared his faith in God and Christianity, in articles, speeches, and personal correspondence. Historians have often attributed von Braun's rapid flurry of God-fearing pronouncements as evidence of the rocketeer's lifelong streak of opportunism.[98] Clearly, when it was popular to be a Nazi in Germany, von Braun was a Nazi; when it was popular to be a Christian mystic cum rocket scientist in the United States, von Braun adapted. However, the evidence suggests that von Braun's religious beliefs were authentic, and in fact, either lay at the core of his passion for spaceflight, or came to justify the darker implications of his fascination with the rocket as he grew older.

Von Braun's religious beliefs concerning spaceflight were firmly grounded in Christian apocalypticism. He believed strongly in the Revelation promise of a Last Judgment and proclaimed as much to his biographer, Erik Bergaust. "It seems to me,"

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[96] Erik Bergaust. *Wernher von Braun*. New York: Stackpole Books, 1976. p. 108.
[97] David Noble. *The Religion of Technology*. New York: Knopf, 1997. p. 124.
[98] Conversation with Neufeld, May 2000.

von Braun admitted, “that two stimuli are necessary to make man endeavor to conform to the accepted ethical standards.

> One is the belief in a Last Judgment, where every one of us has to account for what we did with God’s precious gift of life on Earth. The other is the belief in the immortality of the soul which thus can cherish the reward or suffer the penalty decreed in the Last Judgment. The belief in God and in immortality of the soul thus gives us the moral strength and ethical guidance we need for virtually every action in our daily lives.[99]

Von Braun defended the utopian promise of spaceflight in similarly millenarian terms. As early as 1959, he was speaking of extraterrestrial transcendence in a language approaching that of a minister. That year, Chicago Theological Seminary President Howard Schomer submitted a public challenge to von Braun in the pages of the *Christian Century*. "Is contemporary man clean enough to visit, perhaps to colonize, the heavens?" Schomer inquired of von Braun. "Are the silent and distant heavens, towards which seething humanity has immemorially raised its vision in pursuit of a timeless peace, doomed to become the source of our most ghastly military danger?"

> Or could it be that you and your colleagues are but the half-conscious agents of man's flight from a habitat irrevocably condemned, a planet appointed to destruction? Is your true name Noah, are your hapless rockets the forerunners of a new ark?[100]

Von Braun responded to the letter a month later, outlining his extraterrestrial millennialist vision in bold terms. Von Braun justified spaceflight as necessary to prevent the extinction of mankind itself:

> ...The material benefits to mankind which will accrue from expanded physical frontiers will permit a greater number of *homo sapiens* to inhabit the universe – will permit the survival even of this species when our own solar system in some far distant eon is a collection of cold dead rocks floating in the dark airless void –

[99] Bergaust, p. 110.
[100]Howard Schomer, "To Wernher Von Braun," in *Christian Century* , December 23, 1959. pp. 1498-99.

> as it surely someday must be. More importantly, perhaps, man may even be the master ecological link of all life. Upon his survival may perhaps depend the sole survival and expansion of life in the universe. If this should be so, if man is Alpha and Omega, then it is profoundly important for religious reasons that he travel to other worlds, other galaxies; for it may be man's destiny to assure immortality not only of his race, but even of the life spark itself.[101]

Von Braun's passionate and apocalyptic defense of space flight reveals several of the central elements of the extraterrestrial millennialist ideology: the achievement of symbolic immortality for humanity by escaping a doomed Earth, the Tsiolkovskian desire to seed the universe with life, and the Christlike ascension of mankind into heavenly destiny. While he was clearly orienting his answer to the florid query of a minister, his subsequent pronouncements on the significance of spaceflight for mankind cast his answer as less opportunistic than religiously authentic.

After the landing of men on the moon, von Braun's religious pronouncements increased dramatically. Von Braun repeatedly expressed his devotion to Christianity in correspondence sent to admirers. "In our search to know God, I have come to believe that the life of Jesus Christ should be the focus of our efforts and inspiration." he wrote to a Miss Anita Andries of Waterloo, Iowa. Andries wrote von Braun after reading a devotional piece he penned for the *Lutheran Digest* in 1971. "The reality of this life and His resurrection is the hope of mankind." Von Braun told Andries. He went on to say that he believed that his work was part of the search for God and the quest to attain the "new millennium." "In the reaching of the new millennium through faith in the words of Jesus Christ," the rocketeer wrote, "science can be a valuable tool rather than an impediment. The universe as revealed through scientific inquiry is the living witness that God has indeed been at work."[102] In another letter, von Braun admitted that "the grandeur of the

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[101]Wernher Von Braun, Letter, *Christian Century*, January 27, 1959. p. 106.

[102] Wernher von Braun to Anita M. Andries, Letter, November 30, 1971. NASA History Files. Von Braun seemed fond of the term "millennium." In a piece written in 1971 for the Goddard Biblio Log, distributed by the Friends of the Robert Hutchings Goddard Library, von Braun expressed admiration for Robert

cosmos" had opened his eyes to the "certainty of a Creator" and that among the parts of creation which were most motivational for him were "the will of a species to live and propagate."[103]

Von Braun's enchantment with his role as discoverer of God's will coupled with his role as fashioner of weapons of apocalyptic destruction evokes a disturbing duality. Even as he dreamed of providing humanity with rockets to escape the planet, he worked tirelessly to develop rockets to ferry nuclear death around the world. His passion involved both a devotion to the development of technologies capable of destroying mankind's home planet, and a devotion to removing mankind from the Earth. In a sense, von Braun seems to be like a firefighter who is secretly an arsonist, yet on a grand scale. He desires to save the human race, but can only do so if he destroys their home first. In the process, he can be present at the conflagration. This dual millennial ambition – progenitor and destroyer – appears in the personalities of all of the rocketeers.

Von Braun had no qualms about exaggerating threats to scare the American people to support space and high technology weaponry expenditures. Space boosters of the 1950s, and von Braun in particular, played on American fears of nuclear disaster to compel the government to fund space exploration initiatives.[104] In provoking unfounded fears of nuclear-equipped space stations under the control of totalitarian dictators, boosters like von Braun succeeded in making inattention to space exploration politically disastrous. In a famous (infamous) series of articles in *Collier's* in the early 1950s, von Braun helped spread misinformation concerning the potential use of space stations as

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Goddard's devotion to the good of mankind as the ultimate end for the creation of apocalyptic weaponry. "Goddard's work was hardly noticed outside the field of rocketry," von Braun wrote, "But it was one of the grand steps and concepts that have led the human race toward the millennium." Von Braun's piece was specifically related to an apocalyptic missive Goddard wrote entitled "The Last Migration," which is discussed below.

[103] Wernher von Braun to Phyllis J. Murphy, Letter, December 6, 1971. NASA History Files.

[104] Howard E. McCurdy. *Space and the American Imagination.* Washington, D.C.: Smithsonian Institution Press, 1997. pp. 53-81.

nuclear launching platforms. "There will also be another possible use for the space station – and a most terrifying one. It can be converted into a terribly effective atomic bomb carrier."[105] Of course, von Braun lobbied hard to get such a space station built. Whether von Braun's scare tactics were motivated by opportunism concerning the utopian promise of spaceflight, or deeper malevolent notions concerning the desirability of vacating the planet, the Christian millennial roots of von Braun's worldview -- so redolent of the Last Judgment and the Rapture -- seem clear.

Just as Tsiolkovsky and Oberth believed in the existence of a higher extraterrestrial civilization, overlording the Earth, and tantamount to God Himself, von Braun, despite his high public visibility as compared with that of earlier rocketeers, expressed hints of such a belief as well. In replying to a letter from a private citizen, von Braun hoped that the technological hurdles to long-distance spaceflight would be overcome through a literal *deus ex machina*. "Voyages to other star systems must wait for tremendous technological strides," he told a Herman J. Prager of New Orleans in 1971. "[But] [w]e may not have to make these strides ourselves.

> With millions of galaxies, each containing billions of stars, other intelligence must exist in the universe; there is the possibility that some advanced life form might deem it appropriate to catapult our technology thousands of years into the future.[106]

Written in 1971, as the moon missions were rapidly losing public and governmental support, von Braun's hope for an extraterrestrial boost from above is perhaps only indicative of desperation.

Von Braun was no religious fanatic, but his preoccupation with Christ's resurrection and his adherence to a philosophy concerning the need for humanity to decipher the "two books" of Nature and the Bible, shows that the backdrop of Christian

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[105] Wernher von Braun, "Crossing the Last Frontier," *Collier's*, March 22, 1952. p. 74.
[106] Wernher von Braun, Letter to Herman J. Prager, III. May 28, 1971. NASA History Files.

belief was never far from his mind. Such beliefs became more visible as von Braun grew older, but there is reason to assume that such a backdrop influenced his views on space travel long before his public professions on the subject. Like his rocketeer mentor Oberth, von Braun envisioned human endeavor on Earth as prelude to expansion into the universe and repeatedly warned that failure to fashion technologies of transcendence could mean doom for the human race. The similarity of this view with the escapist mythos of the Christian drama, coupled with his repeated professions of faith in his later years, paints a portrait of a scientist influenced profoundly by a metaphysical framework through which he justified his role as developer of apocalyptic weaponry. Von Braun was an opportunist, certainly, but to deny that he was truly motivated by metaphysical impetus is to deny the sincerity of all who claim to be motivated by a higher call. Von Braun's higher call was to help get at least some of the human race off the planet before it blew up. His colleague Krafft Ehricke would be even more adamant about such an imperative.

**Krafft Ehricke**

While von Braun remains the most renowned member of the Nazi rocket team to make their way over to the United States, it is another Nazi rocketeer who preserved the harder-edged impulses for space flight found in Tsiolkovsky and Oberth. In the years following the Apollo missions, von Braun's Peenemunde colleague, propulsion engineer Krafft Ehricke, campaigned tirelessly for the cause of space flight – and cast those who thought space exploration an escapist fantasy as tantamount to the barbarians who brought down Rome.

Ehricke’s most enduring philosophical contributions to the spaceflight movement were his formulation of the three “fundamental” laws of astronautics and his concept of

the "extraterrestrial imperative," the idea that man *must* move into outer space to stay alive. In November 1957, in the journal *Astronautics*, Ehricke proposed a bold metaphysical ideology of spaceflight, which he summed up in three simple laws. In the first law, Ehricke demanded an unquestionable belief in the superiority of the human species: "Nobody and nothing under natural laws of this universe impose any limitations on man except man himself." Secondly, Ehricke asserted that no place in the universe was off limits to man, and no place should be considered as such, in any metaphysical system: "Not only the earth, but the entire solar system, and as much of the universe as he can reach under the laws of nature, are man's rightful field of activity." And lastly, Ehricke proposed a form of astronautical devotion to a particular cause – a common concept of human destiny in space: "By expanding throughout the universe, man fulfills his destiny as an element of life, endowed with the power of reason and the wisdom of the moral law within himself."[107]

Ehricke's "extraterrestrial imperative," introduced after the landing of men on the moon, was even more passionate and messianic. Earth, for Ehricke, was a "cage," a "mudhole." In an article published in 1971 in the *Bulletin of the Atomic Scientists*, Ehricke explained his belief in the "extraterrestrial imperative": "[W]e must give Man of tomorrow a world that is bigger than a single planet… Man's root planet must be the seat of his power," he wrote. "[And] not his cage."[108] Being confined to Earth, Ehricke felt, would spell the doom of mankind. "Man seems to be locked into a cosmic reservation that, for all its wealth, threatens to be a scanty Eden for his numbers and aspirations in the future." If Ehricke's imagined imperative of extraterrestrial expansion and colonization was not met, he warned, Western civilization would come under immense threat.

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[107] Krafft Ehricke, "The Anthropology of Astronautics," *Astronautics*, November 1957. pp. 23-27.
[108] Krafft Ehricke, "Extraterrestrial Imperative," in *Bulletin of the Atomic Scientists*. November 1971. p. 19;26.

"Confidence in a soaring future – spiritually as well as materially – is the essence of our techno-scientific civilization and Western Man's greatest message to mankind," Ehricke declared. "Erosion of this confidence threatens the value system and weakens the drive on which our monumental accomplishments rest, ever since the dawn of the Renaissance."[109]

Like Tsiolkovsky, Ehricke saw the evolution of humanity into supermen as part of the imperative. "If we want to survive, then yes – we have to go out into space," Ehricke told an interviewer in 1981. "Then we will experience, let's say in an extraterrestrial environment like that of the moon under one-sixth of the Earth's gravitational field, what I call an 'anthropological divergence.'… Even on Earth you have deviations in skin color, bone structure and civilizations. It is naïve to believe we can live on the moon and stay exactly as terrestrial humans."[110] And Ehricke did not see this future evolution as neutral. Extraterrestrial humanity, he imagined, would be superior to Earthlings. They would be so superior, in fact, that Ehricke imagined that, as in the Last Judgment, extraterrestrial humanity might have to destroy, or at least utterly control, their less civilized cousins below. The difficulty of living in space would create a more holy form of humanity. "Man now has to become the creator of what is provided on Earth free. And what is provided free is always misused, not recognized or valued. We were born with a silver spoon in our mouths and behave accordingly

> This doesn't mean [extraterrestrial humanity will] have no conflicts up there, but they may look at this planet as fascinating and unbelievably cruel. Maybe there might come a time to limit, in space, the people who are working only on behalf of Earth. Because they might carry their hatreds, their prejudices, their historical distortions that the endless war of 500,000 years or more has frozen into their being, like a magnetic field is frozen into a solar wind.[111]

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[109]Ehricke, "Extraterrestrial Imperative," p. 18.
[110] "The Lost Decade," in *Space World*, March 1981. Vol R-3-207.
[111] "The Lost Decade," in *Space World*, March 1981. Vol R-3-207. p. 18.

Ehricke's imagined future of extraterrestrial humanity's lordship over a zoo-like Earth undoubtedly involved the Promethean creation of globe-altering technologies, mainly because Ehricke was hard at work thinking up such innovations. Not only did Ehricke dream of colonizing other planets with a more highly advanced and cultured super-humanity; he also anticipated the fundamental alteration of night and day. In 1970, Ehricke proposed the construction of a "solar torch" to reduce urban crime. A reflector placed in stationary orbit 22,300 miles above the Earth would create permanent illumination of a 200-mile swath of land.[112] The idea that this illumination would prevent millions of people from seeing the stars at night did not appear to be an issue; control of an imagined unruly criminal populace was the prime consideration. In Ehricke's future, more highly advanced humans like himself would have godlike dominion over a depraved and criminal Earthbound populace. Despite a gap of more than three and a half centuries, Ehricke's vision of the future is reminiscent of Isaac Newton's imagined millennial domination of Earth by the "children of the resurrection." Like the dimly lit caverns of Hell in Aquinas' theology, Ehricke's solar torch would, as a lesson and pleasure to the blessed, illuminate the toils of the Earthbound damned.

**Triumph of the Will**

Wernher von Braun, Krafft Ehricke, Hermann Oberth, and Max Valier were not the only men to dream of spaceflight as they scrambled to create apocalyptic weapons for the Third Reich. There were countless others, also possessed of varying extraterrestrial millennialist fantasies. Perhaps the most damning sign of the danger of the Nazi regime's

[112] "'Solar Torch' Asked to Help in Crime Battle," *Baltimore Sun*. September 11, 1970. In 1999, the Russian space program actually tested such a reflector, dubbed the Znamaya 2.5, ostensibly for permanent illumination of mining and farming operations. The fact that such a reflector would be very useful in the control of large populations was rarely mentioned in news reports surrounding the Russian experiment, which ultimately proved a failure. See http://www.space-frontier.org/Events/Znamya/.

materialization of millennial beliefs is revealed in the deepest sins of the rocketeers: the deaths of tens of thousands of concentration camp slaves as they toiled to build V-2 rockets for von Braun and his colleagues.

Federov, Tsiolkovsky's mentor, envisioned utilizing forced labor to achieve his apocalyptic "common task" of colonizing the universe and resurrecting the dead. The Nazi rocketeers put the Russian millennialist's ideas into action. Over 20,000 slaves – mostly Jews -- were starved, beaten to death, hanged, burned, and gassed. Often without water, they bathed in their own urine.[113] Countless numbers died of disease. For months on end these prisoners toiled in conditions that were arguably the worst found in any Nazi concentration camp. In Auschwitz, the prisoners were kept in inhumane conditions, several to a bunk, in the fierce cold of southern Poland. But in Dora, the prisoners rarely even had the privilege of seeing the sun. They worked underground for days upon days, their sleeping quarters in tunnels directly adjoining mines, within which explosions occurred around the clock. Noxious and poisonous fumes from the explosions created a subterranean concentration camp Hell. To punish rebellion, camp slaves might be hanged from the yard-arm of the rocket platform, a chilling symbol of the consumption of souls to feed and fulfill von Braun's boyhood dream of entering heaven.[114] Albert Speer, minister of armaments for the Third Reich, pronounced himself revolted at the living conditions at Dora.[115] Shortly before his death, von Braun himself admitted to a TV interviewer that conditions at Dora were "absolutely horrible" and "hellish."[116]

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[113] Michael Neufeld, "Introduction: Mittelbau-Dora – Secret Weapons and Slave Labor," in *Planet Dora* by Yves Beon. New York: Westview Press, 1997. pp. xiv.
[114] Neufeld, "Introduction: Mittelbau-Dora – Secret Weapons and Slave Labor," in *Planet Dora*, p. xxi.
[115] Albert Speer. *Infiltration*. New York: Macmillan, 1981. pp. 210-11.
[116] Michael Neufeld, "Introduction: Mittelbau-Dora – Secret Weapons and Slave Labor," in *Planet Dora* by Yves Beon. New York: Westview Press, 1997. pp. ix – xxvii.

In Dora, the dark side of the extraterrestrial millennialist dream achieved its apotheosis. In attempting to transcend the Earth, von Braun and his colleagues had materialized an escapist, elitist, and genocidal fantasy born of the Christian millennial apocalypse. Through their Rapture, the iniquitous would be left behind on Earth, and there subjected to the torments of an angry God. "The Earth-centered Jew has no soul," claimed Alfred Rosenberg. In becoming the angry God by attempting to invade his domain and conquer heaven, the rocketeers became the deliverers of the Last Judgment for thousands of innocents. The Nazis, supposedly people of the "oversoul," had no qualms about exterminating millions to achieve the advanced rocket state they believed was their destiny and due. The Reich's rocketeers, passionately devoted to conquering heaven, also thought little of the flesh symbolically seared in the fiery backdraft of their rockets.

"This system has worked well, and the employment of detainees in general has had considerable advantages over the earlier employment of foreigners," the memo reads, "especially because all non-work-related tasks are taken over by the SS and the detainees offer greater protection for secrecy…. Production in the F1 [the main assembly building at Peenemunde] can be carried out by detainees."[117] According to Michael Neufeld, this memo authorized the use of concentration camp slave labor at Peenemunde for the express purpose of building rockets. Its author was Arthur Rudolph, the Project Manager for NASA's Saturn V lunar rockets during the Space Age. In 1984, confronted by the Justice Department's Office of Special Investigations with damning evidence that he had played a pivotal role in the deaths of over 30,000 slaves four decades earlier, Rudolph chose exile to Germany over trial.

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[117] Michael Neufeld. *The Rocket and the Reich*. Cambridge: Harvard University Press, 1995. p. 187.

The migration of the German rocketeers to the barren expanses of Fort Bliss in West Texas was not merely a transplantation of technical expertise vital to the American effort to develop ICBMs capable of incinerating Russian cities. At its deepest level, Operation Paperclip, the secret Army program which whisked Nazi Germany's scientific and technical elite across the Atlantic, was an intellectual and ideological transplantation. During the Space Age, the German rocketeers at Peenemunde became America's foremost spokesmen for the spaceflight dream. While we have seen that the United States had long possessed a deep streak of Christian extraterrestrialism, the young nation had few influential philosophers of exo-millennialism comparable to Tsiolkovsky, Oberth, or von Braun. In the field of science fiction, the United States had many prognosticators and space enthusiasts who waxed poetically about a human future in outer space, but as far as a rocket-centered techno-philosophy of Earth transcendence went, the U.S. was relatively intellectually poor.

Yet rocketry did not appear first on American shores with the captured V2s of what was left of the Nazi effort. Homegrown American rocketeers did exist, and a brief glimpse at the metaphysical beliefs of two of them – Robert Goddard and Jack Parsons – reveals that exo-millennialism was a growing philosophical movement in America even before the Second World War.

## 3: The American Rocketeers

The relocation of the best Nazi rocketeers to the United States at the end of the Second World War brought to American shores those men who would become the nation's most prominent public relations ambassadors for spaceflight and extraterrestrial millennialism. In the three decades following their relocation, the Peenemunde rocketeers were instrumental in helping shape American public opinion concerning the promise of spaceflight. In best-selling books, public addresses, films, and even through Disney cartoons, the German rocket experts characterized outer space as a boundless frontier awaiting American conquest and control.

But the American space program would not just take on a German accent, but a British one as well. Some of the most prominent theorists and boosters of extraterrestrial millennialism would be heirs to the legacy of British techno-futurists J.D. Bernal and H.G. Wells. Arthur C. Clarke, through both his science fiction and "astro-futuristic" non-fiction essays, helped explain space travel in a triumphal and yet easy to understand parlance for interested Americans.[118] Author Freeman Dyson, born in England, would, like Leo Szilard before him, dream of constructing massive nuclear bombs with the justification that someday they would help power spacecraft to distant suns.[119]

It is a fact that the United States possessed few homegrown rocketeers who were also effective missionaries for the extraterrestrial cause. Tsiolkovsky, Oberth, and von Braun were always eager to explain their ideological reasons for constructing rockets. While NASA officials and astronauts would espouse aspects of the extraterrestrial

[118] See Arthur C. Clarke. *Profiles of the Future* (1963); *The Promise of Space* (1968); and many others.
[119] Freeman Dyson. *Disturbing the Universe*. New York: Harper & Row, 1979.

millennialist philosophy, the majority of those working on the space program did so for more mundane and practical reasons, such as career advancement and money.

William James's philosophy of pragmatism best characterizes the American approach to space exploration in the twentieth century. The distinctive anti-philosophical bent to the American character may have mitigated against the emergence of an esoteric space philosophy. It was left to the dreamers of the Old World to bring over the passionate forms of extraterrestrial millennialism that would become increasingly influential during the 1960s. Of course, the United States did possess homegrown rocketeers, and at the beginning of the Space Age, sought those men out to valorize them as national heroes during the Cold War. Those native-born Americans most active in rocket science and engineering did not espouse the forms of Christian millennialism popular among the Old World rocketeers. Robert Goddard and Jack Parsons, two of the more influential American rocketeers, each derived their inspiration from sources other than Christian fundamentalism. Goddard took his metaphysical inspiration from the pages of science fiction, most notably the early novels of H.G. Wells and his imitators; Parsons took his inspiration from the Satanic writings of Aleister Crowley.

However, just as the Soviet and Russian rocketeers advocated a form of extraterrestrial millennialism divested of explicitly Christian language, those rocketeers in the United States derived inspiration for their craft from forms of millennialism indicative of the "free-market" religious climate of their homeland. H.G. Wells's fiction was apocalyptic, if not explicitly Christian. And Parsons's inspiration, in being "anti"-Christian, was as millennial an ideology as that of any Christian fundamentalist. In the United States, millennial excitation permeates all strata of society and knows no religious bounds.

**ROBERT GODDARD**

Robert Goddard made many firsts in the field of rocketry, but due to his reticence to collaborate with others ended up having little influence on the course of the technology in the United States. During the Space Age, Goddard was repeatedly touted as the United States's true homegrown rocketeer, largely in a public relations effort to cloak the fact that most of NASA's top engineers had been transplanted from Nazi Germany. However, he was one of the first men to conceive of the idea of using liquid propellants in rocketry; his early twentieth century popularization of high-altitude rocketry helped increase interest in the possibilities of such feats; and he attracted the interest of investors such as Charles Lindbergh. Furthermore, while his contemporaries Tsiolkovsky and Oberth were largely theoreticians, Goddard actually devoted much of his time to the practical goal of creating a workable rocket. It is this streak of American pragmatism which perhaps best describes his character.[120]

Robert Goddard expressed a preoccupation with self-powered flight from his youngest years. One of his earliest memories involved a failed attempt at electrical levitation through the use of the zinc from a discarded battery. Goddard scuffed the zinc along a gravel walk, climbed a fence, and jumped, in his words, “convincing myself that I had jumped higher.” His mother saw his experiment and “called out to me to be careful because it might work and I might go sailing away, without being able to come back.”[121]

But Goddard's real interest in rocketry came after reading H.G. Wells's apocalyptic science fiction classic, *The War of the Worlds*. Wells’s novel inspired him so

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[120] See J.D. Hunley, "The Enigma of Robert H. Goddard," in *Technology and Culture*. Vol. 36, No. 2, April 1995. p. 333. Also "The Goddard Moon Rocket," in *Electrical Experimenter*, February 1929; James R. Randolph, "Can We Go to Mars?" in *Scientific American*, August 1928, pp. 140-42; Richard Rhodes, "The Ordeal of Robert Hutchings Goddard: 'God Pity a One-Dream Man,'" in *American Heritage*, Vol. 31, No. 4. June/July 1980. pp.24-32.

[121] Robert H. Goddard, “Robert H. Goddard: An Autobiography,” in *Astronautics*, April 1959. p. 24.

profoundly that 34 years after first reading the book, Goddard wrote a fan letter to Wells. At the time Goddard was 50 years old. Goddard described his life's work to Wells, and lamented near the end of the letter that he did not know how many more years he had left to work on the problem of transcending the sky. "What I find most inspiring is your optimism," Goddard told Wells, "It is the best antidote I know for the feeling of depression that comes at times when one contemplates the remarkable capacity for bungling of both man and nature."[122] Wells's novel affected Goddard so profoundly that the rocketeer retained a tradition of rereading the apocalyptic novel every Christmas Eve.

What inspired Goddard about Wells's book was most likely the message of the epilogue. Wells portrayed life bound to a post-invasion Earth as anxious and doomed. "We have learned now that we cannot regard this planet as being fenced in and a secure abiding place for Man; we can never anticipate the unseen good or evil that may come upon us suddenly out of space," relates the narrator. For Wells, the attack from outer space helped bring humanity closer together, and at the same time made terrestrial existence that much more tenuous and brief. The only answer, Wells intimated, to the union of humanity coupled with the new terrestrial anxiety, was escape from the planet altogether. In the novel, the Martians, expelled from Earth, take up refuge on Venus. Wells's narrator hoped that Venus could someday become a similar refuge for men. "[W]hen the slow cooling of the sun makes this earth uninhabitable, as at last it must do, it may be that the thread of life that has begun here will have streamed out and caught our sister planet within its toils," he muses. "Dim and wonderful is the vision I have conjured up in my mind of life spreading slowly from this little seed bed of the solar system throughout the inanimate vastness of sidereal space." Wells's vision of Earth-life expanding throughout the universe as a bulwark against the death of the sun remained the

[122] Robert H. Goddard, Letter to H.G. Wells, April 20, 1932. NASA History Files.

overriding inspiration for Goddard's later fashioning of rockets for the United States Army.[123]

However, Goddard was not only inspired by Wells's vision of a threatened Earth awakening to the necessity of terrestrial escape, but also an infantile American sequel that followed on the heels of *War of the Worlds*, Garrett Serviss's newspaper serial *Edison's Conquest of Mars.* While Wells's novel provided an ironic perspective on Victorian colonial brutality turned against the English by a superior civilization[124], Serviss's sequel subverted this message. Written during the Spanish-American war, during an era of expanding American imperialism, *Edison's Conquest of Mars* portrayed the United States as fighting back against the Red Planet's menace. Led by conqueror-inventor Thomas Edison himself, the Americans fly to Mars using electricity and lay waste to the beastly extraterrestrials instead of waiting in fear for the Martians to strike again. Serviss's sequel stressed the capability of American military and technological might in bringing the fight to the invaders' home planet. The United States would not wait for another invasion, but would develop spaceflight capabilities themselves and free the planet of the anxiety of imminent apocalypse. Serviss describes the Martians as demonic and frighteningly intelligent:

> The sensations of one who had stood face to face with Satan, when he was driven from the battlements of heaven by the swords of his fellow archangels... might not have been unlike those which we now experienced as we gazed upon this dreadful personage, who seemed to combine the intellectual powers of a man, raised to the highest pitch, with some of the physical features of a beast, and all the moral depravity of a fiend.

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[123] H.G. Wells. *War of the Worlds*. (1898) Online at http://etext.lib.virginia.edu/toc/modeng/public/WelWorl.html.

[124] As science fiction author and critic Brian Aldiss described it, the unspoken message of *War of the Worlds* was, "Look, this is how it feels to be a primitive tribe, and to have a Western nation arriving to civilise you with Maxim guns!" Brian Aldiss. *Billion Year Spree*. London: Weidenfeld and Nicolson, 1973.

"Kill him," said someone. "He is too horrible to live."[125]

In Serviss's adventure, the lone inventor figure saves the day. It would seem from Goddard's reaction to the book that he took upon himself all of the messianic qualities of Serviss' conquering Edison. For Goddard, Serviss's sequel injected the necessary American inspiration into the less triumphal Wellsian conclusion. Shortly after reading Wells's and Serviss's books, Goddard had a visionary experience that he claimed altered the course of his life.

In mid-October of 1899, Goddard climbed a ladder propped up against a cherry tree in his backyard. He looked up at the sky and saw Mars. Something happened to Goddard after gazing at Mars. We cannot be sure what exactly went through his mind, but from that point on, for his entire life, Goddard would refer to October nineteenth as "Anniversary Day."[126]

"It was one of the quiet colorful afternoons of sheer beauty which we have in October in New England," Goddard wrote later.

> As I looked toward the fields at the east, I imagined how wonderful it would be to make some device which had even the *possibility* of ascending to Mars, and how it would look on a small scale, if sent up from the meadow at my feet... I was a different boy when I descended the ladder. Life now had a purpose for me.[127]

For the rest of his life, Goddard devoted himself to the construction of the rocket.

Although Goddard authored no full-length metaphysical work in the style of Oberth and Tsiolkovsky, the few literary pieces he did leave behind show a profound degree of extraterrestrial millennialist thinking. Unlike Tsiolkovsky, Goddard didn't envision an outer space utopia. Instead, Goddard saw outer space as the only manner of escape for a mankind increasingly choked by war, destruction, famine, disease. Goddard

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[125]Garrett P. Serviss. *Edison's Conquest of Mars*. Los Angeles: Carcosa House, 1947 (1898), p. 68.
[126] See J.D. Hunley, "The Enigma of Robert H. Goddard," in *Technology and Culture*. Vol. 36, No. 2, April 1995. p. 333.
[127] Goddard, "Autobiography," p. 27.

locked his most secret hopes for rockety securely in a safe, and instructed the safe to be opened only after his death. What he wrote was, he said, to "be read thoroughly only by an optimist." Entitled "The Last Migration," his piece described the inevitability of the Earth's destruction and the necessity for human escape from a doomed planet.

Goddard believed in an apocalyptic end to civilization. "Will it be possible to travel to the planets which are around the fixed stars," he wondered. "when the sun and earth have cooled to such an extent that life is no longer possible on the earth?" Through his rocketry, Goddard hoped to save mankind. On a different planet, orbiting a different star, perhaps humanity could reseed itself and continue to evolve. "The most desirable destination," he wrote, "would be near a large sun or twin suns, on a planet like the earth… Here, further development of the race could take place for many ages before the sun or suns became too cool to support life."[128]

Goddard's writings offer a glimpse into the deepest motivations of the rocketeer – dreams of salvation, messianism, and immortality for the human race. There was clearly an apocalyptic streak in a man who reread *War of the Worlds* each Christmas, feared the imminent demise of the sun, and devoted his life to constructing the physical means of reaching heaven. Like his Russian and German counterparts, Goddard's ambitions were vast, and his inspiration derived, if indirectly, from the conceptual framework supplied by Christian millennialism.

### JACK PARSONS

The religious beliefs of rocket pioneer Jack Parsons bear some mentioning in relation to the beliefs of the other pioneers discussed here. Certainly not as well known as von Braun, Goddard, Oberth, or Tsiolkovsky, Parsons was still one of the most

[128] Robert H. Goddard, "The Ultimate Migration," in *The Goddard Biblio Log*, November 11, 1972. pp. 1-3.

influential rocket designers of the post-WWII era. His work at the Guggenheim Aeronautical Laboratory at the California Institute of Technology (GALCIT), the Southern California rocket development center which was to later become the Jet Propulsion Laboratory (JPL) earned him the admiration of Theodore von Karman, the Hungarian-born rocketeer at the center of the pre-Nazi émigré American rocket program. Von Karman considered Parsons the third most important figure in American rocketry, behind von Karman himself and his second-in-command Frank J. Malina.[129] The JPL group was never a big fan of the reculsive and abrasive Goddard. [130]

Parsons exhibited many of the same extraterrestrial millennialist beliefs of the other rocketeers discussed in this chapter yet in a decidedly original way. As boldly metaphysical as the other early rocketeers, Parsons couched his beliefs not in the language of traditional Christianity but instead in the obtuse arcana of early twentieth century Satanism. During his years at GALCIT, Parsons headed the Pasadena chapter of Aleister Crowley's Ordo Templis Orientis and frequently corresponded with the famous Satanist and magician. Parsons' interest in spaceflight borrowed a great deal from the hermetic and magical teachings that informed Isaac Newton himself – yet Parsons specifically denied the authority of the Judeo-Christian God.

In a work entitled *Liber OZ*, Parsons publicly stated what he believed were the inherent rights of man. Some of the pronouncements in the work were quasi-Nietzschean and eerily reminiscent of Aryan philosophy: "The law of the strong: this is our law and the joy of the world," "Do what thou wilt shall be the whole of the Law." Others were boldly anti-Christian: "There is no god but man," and "Man has the right to live by his

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[129] John Carter. *Sex and Rockets: The Occult World of Jack Parsons*. Venice, California: Feral House, 1999. p. 9.

[130] Goddard had stubbornly refused to work with the GALCIT team and as a result, his designs had little influence on the future of American rocketry. Von Karman said of Goddard, "[He] was an inventive man and had a good scientific foundation, but he was not a creator of science and he took himself too seriously." Theodore von Karman and Leed Edson, *The Wind and Beyond*. Boston: Little Brown, 1967. p. 242.

own law… Man has the right to eat what he will… Man has the right to think what he will… Man has the right to love what he will… Man has the right to kill those who would thwart these rights."[131]

His interest in apocalyptic subjects was undoubtedly a large part of his life as he devoted his spare time in trying to create the Antichrist. In a book published after his death, Parsons even identified himself as the Antichrist and cited a litany of accusations concerning Christianity's corrosive influence on the spirit of man. He concluded his screed by claiming that "within nine years" a nation of Earth would "accept the Law of the BEAST 666… and that nation will be the first nation of earth."

> Therefore I, THE ANTICHRIST, call upon all the Chosen and elect and upon all men, come forth now in the name of Liberty, that we may end for ever the tyranny of the Black Brotherhood.[132]

Parsons, clearly, was another rocketeer profoundly obsessed with the millennial drama, despite being on what many other rocket pioneers would have considered the wrong side of the battle.

How Parsons's philosophy connects with the belief systems of the other rocket pioneers is that he, like them, believed in the inner power of humanity to transcend terrestrial circumstance and achieve a measure of godhood. Like the Soviet perspective on spaceflight, Parsons believed that humanity would conquer the heavens which had formerly been the province of God.

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[131] Cited in John Carter. *Sex and Rockets: The Occult World of Jack Parsons.* Venice, California: Feral House, 1999. pp. 159-160.

[132] Jack Parsons. *The Book of the AntiChrist*. Edmonton: Isis Research, 1980. Cited in Carter, pp. 167-168.

## CONCLUSION

On the eve of the first moon landing, in July 1969, the journal *Christianity Today* published an interview with NASA scientist and self-proclaimed fundamentalist Christian Rodney W. Johnson. Johnson, an expert on the construction and design of lunar bases, freely spoke of his religious beliefs and how they related to his work in the space program. In the interview, Johnson claimed that the "primary significance" of the imminent moon landing could be found in God's command in Genesis to "subdue the earth." "[W]hen God created man, he presented man with [this] divine imperative," Johnson said. "A lunar landing marks a major new step in our dominion over the earth. Our escape from it shows our mastery over it."

For Johnson, the cosmography of the Bible gave space exploration a high and exalted place in the pantheon of wonderful achievements. "Man's thoughts about God are almost invariably linked with the heavens. Man in search of God has always looked 'up,'" he claimed. The wonder to be elicited by man's entry into space, Johnson theorized, was a greater wonder than any that could be found through meditation on the glories of earth. "Dorothy Frances Gurney's often quoted poem says that 'one is nearer God's Heart in a garden than anywhere else on earth.' But I think that our entry into space will supersede that, because people are more likely to consider spiritual matters when prompted by the vastness and wonders of space then when admiring the most exquisite rose or orchid."

Johnson also foresaw the onset of great revelations from the space program. "I'm expecting a fresh new manifestation of God in some way. This could take the form of the confirmation of a significant Bible truth." As evidence, he cited the prevalence of a deep religious faith within the inner core of those involved in the space endeavor. "My

contacts with a surprising number of scientists, engineers, and technicians associated with the space program have a deep and vital faith… [M]ost who have a faith in God hold this faith strongly, as if their association with the space program had acted to reinforce their belief." [133]

In the Western world, we can see a chilling duality represented in the figures of many of the rocket pioneers. The matrix with which they looked at the world, the religious and cultural backdrop through which they received their perceptions of the universe – this was always a Christian matrix. Their matrix involved themes of transcendence and redemption, involved the Zoroastrian and Manichean duality of stark good and stark evil, and involved the will to escape a doomed and depraved plane of suffering. By reaching for heaven, the rocket pioneers were expressing a very human desire to be free of suffering and gravity, and to save themselves and perhaps the human race.

But in this aspiration towards the heavens, the darker side of spaceflight will is revealed. In straining for the stars, each and every rocket pioneer imagined the existence of an elect, a Chosen, an elite to lead the way. In imagining the world as torn between good and evil, they also saw that there would be a force compelling them earthward and bent on their defeat. Federov imagined this force as the less advanced lifeforms of Earth, and thought of them as the servants of death. Alfred Rosenberg imagined a "world-affirming," earthbound Jewry as the force preventing the transcendent flight of the highly evolved Aryan. Oberth imagined that the less-developed of the Earth were holding back the full development of the human race, and polluting humanity's genetic worthiness. Parsons imagined that it was a belief in God himself holding humanity in place and only through the birth of the Antichrist could the Christian prison be sprung. The Chosen and

[133] "Space, Science, and Scripture," in *Christianity Today*. July 18, 1969. pp. 3-6.

elite transcenders – the few deemed worthy for extraterrestrial travel – were the only ones capable of saving the human race. Whether they saw the decline of humanity as part of the inexorable running down of the sun's thermal radiation or as part of the pollution of humanity's impure and unworthy genetic heritage, the rocketeers often cast themselves in the role of extraterrestrial Messiah. Through their will, they sought to make real the instruments necessary for the invasion of heaven. As Messiah, they would also have to judge, and to separate the quick from the dead.

It is a chilling reality, and not a coincidence, that each and every rocketeer dreamed of a blissful, utopian, and messianic use for their creation, yet ended up aiding in the invention of the most murderous weaponry of the twentieth century. Through the messianic and millennial dreams of Tsiolkovsky, Oberth, Goddard, von Braun, and Parsons, no colonization of the universe came about, no blissful zero-gravity escape from suffering has yet been established. All we have are the occasional launch of seven humans into space, and the ability of thousands of earth-transcending rockets to rain nuclear death upon the farflung continents of the only planet we know to possess life. Instead of creating utopia, the rocketeers created a nightmare. Von Braun did not need to divide his time between building intercontinental ballistic missiles and moon rockets for NASA, because they were built from one and the same technology. He, like the other rocket pioneers, became a depressing and hollow representation of the messiah he self-styled himself to be. He dreamed of saving the planet, and yet created the very means to destroy it.[134]

The spacebound dream is a powerful motivator for young and old. The idea of leaving the planet and experiencing the gravity-less freedom of outer space is a highly

[134] As comedian Mort Sahl once quipped of von Braun's autobiography *I Aimed for the Stars*, "It should have been subtitled, *…And I Hit London.*"

popular fantasy. The commonly accepted interpretation of the development of space flight treats its creation in this century as part of the unstoppable march of technology. Technology, the canonical tale reads, has a mind of its own and a will of its own. Yet it is clear from an examination of the motivations and beliefs deep in the hearts and minds of the great astronomers and early rocketeers that they imagined the world in the context of Christian millennialism. They believed, if not explicitly in the literal Christian drama as Tsiolkovsky, von Braun, Oberth, Valier, and Parsons did, in at least a secularized version of millennialism which possessed direct analogues to the religious and prophetic mythos of the apocalypse and rapture. They believed in a catastrophic end of the world, they believed in the existence of an elite that would survive the catastrophic end, and they believed in the ascension of the elite into a region formerly known as heaven. And most of them did not express any great desire to remain on Earth, as evinced by their frequent fantasies of floating, levitating, flying, and transcending. And they all expressed a profound disinterest in the bodies they had been born with, deeming them unfit for space travel, and imagining a future era when humanity would genetically engineer itself or evolve into a higher, better, more powerful and transcendent life form. They dreamed of this because the symbology was present in the Christian millennial drama, with its linear view of time, and its promise of heaven for the devout. They merely sought to use the tools around them to build their own rocket-powered stairway to heaven.

## FROM THE SPACE AGE…

The core reasons behind the interest of the superpowers in the exploration of outer space have long since been established by historians of the era. Despite the lofty moral and spiritual aspirations professed to be behind the development of spaceflight technology, it is an indisputable fact that without the demand for long-range intercontinental ballistic missiles (ICBMs) capable of delivering atomic and hydrogen bombs across oceans to major urban, military and industrial centers in the United States and the Soviet Union, humans would never have set foot on the moon. Rockets and missiles are borne from the same technology, and of the same necessity: control of the skies.

Despite these core reasons, in the first years after the Soviet launch of Sputnik, the romance of space travel reached its apogee in both the United States and the USSR. The quasi-religious dream of human departure from the Earth, in a rapturous ascension into a domain formerly ruled only by God and the angels, was an important and persuasive justification for the race into space for both the United States and the Soviet Union. For the Soviet Union, such an achievement was repeatedly characterized as a triumph of man's intellect and power. As an officially atheist state, the USSR cast the entry into outer space in anthropocentric terms – as a victory for mankind and a refutation of the existence of a higher supra-terrestrial or extra-terrestrial divinity. The United States, on the other hand, in its simmering conflict with the USSR, attempted to counteract the atheist perspective on the importance of manned space flight. With the rhetoric concerning the non-existence of God on the rise in Khrushchev's Soviet Union,

politicians in the U.S. began to increasingly characterize their nation in increasingly fervent terms as the chosen nation of God.

However, the similarities between the U.S. and U.S.S.R. valorization of space far outweighed any doctrinal or interpretive differences. Both nations, in the early years of the Space Age, employed a similarly triumphal and inspirational extraterrestrial millennialist rhetoric as a lofty justification for the baser goals of national security and global domination. By expressing higher ideals in the service of the creation of weapons of mass destruction, the U.S. and the U.S.S.R. attempted to assure their populaces that beyond the apocalyptic threat posed by nuclear-armed rockets lay a glorious and rapturous ascension of humanity into an extraterrestrial wonderland of abundance and freedom. That each nation differed in its characterization of the spiritual value of the extraterrestrial realm mattered little. Both nations, in their rhetorical justifications for the conquest of space, had made outer space the new stand-in for what was formerly known as heaven; and both nations, like passionate preachers indoctrinating their flocks, simultaneously prepared their citizenry for an imminent terrestrial apocalypse and an equally imminent extraterrestrial deliverance.

The common superpower dream of space conquest and eventual colonization, the defining characteristic of the twentieth century era known as the "Space Age," did not maintain its utopian dazzle for very long. Sputnik had motivated the American public to support the space race mainly by creating a pervasive sense of vulnerability and fear, and only tangentially because of the high-minded scientific and exploratory ideals espoused by the Clarkes and von Brauns. As historian Howard McCurdy has noted, the bulk of NASA's employees were not von Braunian romantics, and yet with the launch of Sputnik many of these engineers were swept up in the feverish climate of the Cold War. According to McCurdy, the first justification offered for spaceflight was the romantic

vision of extraterrestrial conquest and exploration. When that explanation failed to excite anymore, NASA officials "sought new rationales for continuing endeavors" and "concocting fears remained part of that strategy."[135]

By 1961, the year Kennedy announced his plan to land astronauts on the moon, serious grumbling could already be heard in Washington's halls of legislative power regarding the cost and wisdom of the entire space endeavor. The ambitious plan swept many up with its grandiosity and challenge, in that it laid down a gauntlet which few lawmakers could avoid, lest they be forever seen as having missed the boat on the most spectacular achievement in human history. However, despite the enthusiasm in many quarters for the space endeavor, suspicions began to creep in that the entire project was nothing more than, as cultural critic Amitai Etzioni dubbed it, a colossal "moon-doggle."[136]

While one might characterize the era immediately post-Sputnik as the apex of the "Space Age," the years of actual manned space flight saw a steady decline in extraterrestrial romanticism and fearmongering, and instead the ascendance of a contrary, nearly diametrically opposite point of view concerning humanity's future and the course of history. Instead of looking to the beauties and possibilities of space, large portions of the American populace instead began to look back longingly at the Earth.

While the arrival of the Space Age in 1957 had the immediate effect of valorizing the triumphalist extraterrestrial dreams of the space pioneers, the increased awareness of the fact of a limited Earth brought on by the departure of humans from the planet helped to create an opposing era born in the mid-1960s. This era was marked by an increasingly high profile planet – a sort of enormous, mute, and until 1968, never before seen

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[135] Howard McCurdy. *Space and the American Imagination*. Washington, D.C.: Smithsonian Institution Press, 1997. p. 78.
[136] Amitai Etzioni. *The Moon-Doggle*. New York: Doubleday, 1964.

celebrity. The “Earth” was on everyone’s lips – it was used to describe the astronaut’s splashdown, their “return to Earth”; or the astronaut’s journey, their “orbit of the Earth”; or their takeoff, the rocket’s “departure from the Earth.” Although the goal, and the public’s attention, was always focused on the astronaut’s attempt to enter space, or reach the moon, the return voyage, the takeoff point, the home of the astronauts, was always Earth. Coupled with the breathless and technologically sublime launch of the rockets from Cape Canaveral was a corollary, and often underappreciated, collective cultural anxiety often remarked on in newspaper accounts of the era: the astronauts' safe return to Earth. Most of what went up in the Space Age, whether it was rockets, chimpanzees, Siberian huskies, or men, came back down to Earth. While the era is frequently referred to as the Space Age, it would be more accurate to see in the era two successive Ages, a Space Age, and a subsequent and correlative “Earth Age.” The repeated employment of the planet Earth as a departure point in science fiction literature, political space rhetoric, and space enthusiast literature helped to create a public awareness of the astronomical reality of the planet unparalleled in human history. With so much attention being devoted to humanity’s departure from the Earth in the early and heady years of the Space Age, a broad cultural identification with a newly recognized Earth was perhaps a foregone conclusion. Instead of the American consciousness being directed towards the pioneering of an empty and available space “frontier,” a contrarian conception of human destiny emerged from the dawning awareness of the finitude, fragility, and utterly exceptional nature of a living planet. And as the 1960s wore on, more and more Americans began to see extraterrestrial utopianism as narrowly elitist in its dream of a highly evolved technocentric Western-style humanity inhabiting the heavens and lording over the other inhabitants of Earth. Through a deep and perhaps semi-conscious reaction to the dawning realities of the mechanization of the sky, 1960s social justice movements – the

Civil Rights movement, the anti-war movement, the women's rights movement, and most of all, the environmental movement – saw in the home planet a champion of the masses, a symbol of the dispossessed, and an ineffable holism towards which to model human society. Compared to the dismissive and often violent manner by which NASA officials, mainstream theologians, and extraterrestrial utopists justified human space exploration – as being a fulfillment of Jehovah's command that humanity "subdue the Earth" – this new vision of the Earth elevated the planet to the status of sacred and inviolable deity, or superhero. The conflict between the designers of the Space Age and the vanguard of the Earth Age was at heart a spiritual battle for the future imagination of the planet. Would it be subdued? Or become holy ground?

**SPUTNIK**

On September 17, 1957, the 100th anniversary of the birth of Konstantin Tsiolkovsky, Russian scientists announced boldly that "the assault on the universe" had begun. The *New York Times* quoted the Soviet Air Force Journal, *Sovetskaya Aviatsia,* as reporting that Tsiolkovsky's ideas would "very soon" be translated into reality. A Radio Moscow broadcast of the seventeenth claimed that the socialist nation would "shortly take the first step into cosmic flight by launching an artificial earth satellite."[137]

Readers of the *New York Times* awoke on the morning of the October 5th to a frightening banner headline, filled with mind-bending statistics: "SOVIET FIRES EARTH SATELLITE INTO SPACE; IT IS CIRCLING THE GLOBE AT 18,000 M.P.H.; SIGNALS PICKED UP FROM 184-POUND SPHERE." The articles that followed in the next few days gave little succor to an American populace still nervous

[137] "Red 'Moon' Launching Predicted," *New York Times*, September 18, 1957.

over the proliferation and increasing power of nuclear armaments exploded in Russia and the desert Southwest in the thirteen years since the decimation of Hiroshima and Nagasaki.

"The weight of the Soviet satellite – 184 pounds… appears to confirm the Soviet Union's ability to launch an intercontinental ballistic missile with a nuclear warhead," a *Times* article on the 6th of October read. The United States was far behind the Soviet Union in developing such technology, despite a pervasive belief among American scientists to the contrary. American propaganda during the 1950s repeatedly characterized the Soviet state as hopelessly and spiritually backward, unable to triumph over the democratic system due to its inherent totalitarianism.

Sputnik became for Americans not only a homegrown realization of the dark threat of aerial apocalypse, a rapid and harsh crash course in the foolish naivete of the "winged gospel" of the heady days of Lindberghian aviation adulation. Sputnik created a profound crisis of confidence in the political propaganda of democratic triumphalism. The American public, claimed *Aviation Week* editor Robert Hotz, had a right to find out why the United States "with our vastly superior scientific, economic and military potential is being… surpassed by a country that less than two decades ago couldn't even play in the same ball park."[138]

Sputnik challenged the American dream at its very heart. As the Puritans believed in a Calvinist-inspired doctrine that "a man is known through his works," or that the outward appurtenances of the successful could be at least some hint to the future salvation of their soul, the United States reacted to Sputnik as an affront against the very moral supremacy of the nation in its Cold War battle against the Soviets. The challenge

[138] Robert Hotz. "Caught Napping," in *The Challenge of the Sputniks*. Richard Witkin, ed. New York: Doubleday Headline Publications, 1957. p. 15.

of Sputnik would not just become a technological or military demonstration of American inadequacy, but became interpreted as proof that something was rotten at the heart of the nation's soul. The apocalyptic overtones attendant on the Soviet Union's easy and overnight domination of the American sky became conjoined with a mood of humility, self-doubt and introspection tantamount to a national heartbreak at being abandoned by the God so many in the nation had prayed to since the end of World War II for blessings in the Cold War. As Preacher Billy Graham told President Eisenhower in a letter after the Soviets managed to send a helpless dog into space on Sputnik 2, "to win this contest I think it is going to take even more emphasis on the need for sacrifice, belt-tightening and renewed dedication, if the American way of life is to be preserved." Americans, Graham told Eisenhower were "growing soft..." "The American people," claimed Graham, "need to look to God Who is the source of all our spiritual and moral strength."[139] If God was displeased with the United States for some reason, Graham intimated, only through proving their worth to Him could the nation be saved. Comments like that of W. Boyd Hunt of the Southwestern Baptist Theological Seminary gave voice to the pervasive sense of spiritual disillusionment Sputnik and Soviet space successes caused among the supposedly American elect. Hunt lamented in 1958, after the Soviets had announced they were going to hit the moon with an unmanned rocket, that "[s]omething would be wrong with Christians if professing atheists were to permanently out-think and out-invent them."[140]

Eisenhower had often described the Cold War in stark moral terms. "This is not a casual argument between slightly different philosophies," he declared shortly after taking office in January 1953. "This is a war of light against darkness, freedom against slavery,

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[139] Billy Graham to President Dwight D. Eisenhower, Letter, December 3, 1957. NASA Historical Files. Eisenhower responded with a brief and non-committal two paragraph thank you note. Also in NASA Historical Files.

[140] "Moon Shot: Its Meaning to 25 Scholars," in *Christianity Today*, October 13, 1958. pp. 25-26.

Godliness against atheism." A year later, Congress passed a bill adding the words “under God” to the Pledge of Allegiance, thus officially identifying the United States as a nation blessed and in the service of God, in contrast to the Soviet Union’s state-sponsored atheism. In this global moral battle, Sputnik became for Americans an atheist machine dividing the people and their protector God. The "space race" Sputnik engendered, in this sense, became part of a holy war for possession of the heavens.

But if Sputnik represented a spiritual affront that needed to be countered through massive federal spending on scientific education and technology, it also offered a faint glimmer of heavenly hope. Sputnik did not just represent the ability of the Soviets to fire intercontinental ballistic missiles tipped with nuclear payloads freely across the Earth towards American metropolitian centers and military installations; it also represented the ability of humans to leave the Earth through their machinery and enter a realm traditionally identified with the Biblical heaven. The threat of instant death from above, and the hope of an eternal life for humanity off of a capricious Earth combined to create, in the era after 1957 an acute sense among the American people that something special was happening, and that this could result in apocalypse, millennial deliverance, or both.

CBS News' resident philosopher, Eric Sevareid, summed up the simultaneous apocalyptic and millennial atmosphere created by Sputnik by noting the division in reaction in the American soul. "Men are divided in their feelings between those who rejoice and those who worry," he succinctly stated. The millennial group – "scientists, mostly," -- were "in raptures that the ascendant, god-like instinct of homo sapiens has driven him from his primordial mud to break, at last, the bond of his earth." The apocalyptic side however, according to Sevareid, knew "that the spirit of man has many parts" and "part of his spirit is not in space; it has not even reached the foothills…" He quoted the *New York Times* editorial page of that morning: "A part of us never came

down from the tree, never crawled out of the cave." Which way the influence of Sputnik would turn was, Sevareid observed, literally up in the air. "The wisest of men does not know tonight whether man in his radiance or man in his darkness will finally possess the spinning ball."[141]

British philosopher Bertrand Russell saw a similar division in reaction, but was much more skeptical about its supposedly hopeful implications. Of the hopeful side, propounded by the von Braunian romantics, Russell had little sympathy. He prophetically remarked that "in no foreseeable future will it be possible for human beings to remain alive on the moon for more than a few days… They might be able to stay on the moon long enough to plant the Hammer and Sickle or the Stars and Stripes on the summit of an extinct volcano, but more than this, I do not think they could accomplish." The same went for Mars, Venus, and Mercury. "I am afraid that, at any rate for several centuries, we shall have to be content with our own planet as the only habitat for human beings."

Russell instead saw the terrifying side of the achievement as a far more realistic a response. "Ninety-nine percent" of scientific and technological research since the beginning of the Second World War, he claimed, had as its goal "the perfecting of methods of mass extermination." This reflected, in his view, the unfortunate basic and pessimistic characteristic of man, that "he is more anxious to kill his enemies than to stay alive himself." The essential question for Russell was not "will it be possible for man to inhabit other planets" but "will it be possible for man to continue to inhabit his own planet?"[142]

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[141] Eric Sevareid. "The First Days in Orbit," in *The Challenge of the Sputniks*. Richard Witkin, ed. New York: Doubleday Headline Publications, 1957. p. 9.

[142]Bertrand Russell, in *The Challenge of the Sputniks*. Richard Witkin, ed. New York: Doubleday Headline Publications, 1957.

The desire to transcend the threat of Sputnik, either through technological one-upsmanship or through escaping a threatened Earth altogether, resulted in the adoption of many exo-millennial dreams by the American political and military establishment. The hope of space travel, so distant even in 1957 as to still seem more a part of science fiction than of reality, gradually became the primary hopeful justification for the creation of bigger and better rockets. As this idea filtered into American culture far beyond the narrow confines of rocketeer philosophy and the space science fiction often based on their visions, it also became wedded to various forms of American spirituality. The space race of the 1960s became an exo-millennial battleground upon which the Soviet Union and the United States fought for the future characterization of heaven.

## 4: Beyond the Ken of Stars

In 1959, David Greenfield asked readers of the *Saturday Review*, "Which Way is Heaven?" The ascension of man into space, and the meaninglessness of terms such as "up" and "down" in space, Greenfield felt, posed a challenging question for those religions fixated on the idea of heaven as "out there." Most Christian scripture, founded on an ancient Middle Eastern conception of the structure of the universe – firmament above, waters below, Earth in midst of waters – retained a deep-seated cosmological dichotomy of "up" and "down." "Heaven has always existed in the mind of man as the abode of spiritual beings and the ultimate destination of believers," Greenfield noted. "Its location has always been 'up.' The devout either look skyward while saying prayers or bow their heads in deference to higher power. Hands are held palm to palm with fingers pointing toward the zenith. The great cathedrals are all vertically dimensioned with spire upon spire directed toward space above."[143] Greenfield was pointing out one of the primary conceptual challenges of the Space Age. The arrival of manned spaceflight, in the very verticality of its technological aim, posed challenges, stoked feelings of ecstasy, and proved downright confusing for the theological minds of the era. While space utopians such as Arthur C. Clarke felt comfortable in the new and emerging era of Earth transcendence, America's Christian theologians felt it their duty to discuss and debate the onrush of the Space Age – an era that promised the mechanical invasion of a domain formerly conflated in the minds of their congregants with heaven.

However, just as Sputnik jolted the Eisenhower administration and Congress to sit up and take notice of the dawning technology of rocketry and its challenge to American military superiority, the theological community recognized in the dangers of the

[143] David Greenfield, "Which Way is Heaven," in *Saturday Review*, July 4, 1959. p. 39.

technology the same intimations of the apocalypse that characterized their response to the destruction of Hiroshima and Nagasaki twelve years earlier.[144] The *Christian Century*'s lead editorial in the issue following the overflight of Sputnik began ominously: "Every great breakthrough of science into areas which have previously been dark and dangerous mysteries fills us with foreboding. Dread consequences rise in imaginary shapes and spread a cloud of foreboding over a suddenly insecure future…"[145] The National Council of the Churches of Christ recognized the duality of Sputnik – both the millennial hope and the apocalyptic danger. "The potentials for life and death in earthman's use of outer space are multiplied many times by the awesome developments of nuclear energy," the Council announced in a 1957 post-Sputnik policy statement, "We see possibilities for good in new dimensions of power, knowledge, and exploration of space… We see possibilities for evil, as in devices to circle the globe in minutes and rain destruction on masses of people anywhere in the world, actually threatening obliteration of most of the human race."[146]

For other clergymen like fundamentalist Presbyterian pastor Richard W. Gray, Sputnik was a not-so-subtle rebuke to God's chosen nation. "We take great pride in our technological prowess, our scientific acumen, our economic strength, our atomic weapons – the kind of pride that has made us lose our sense of dependence on God," Gray stated. "We have been arrogant and displeased our Creator." At the end of the article, Gray envisioned the end of the world if America did not begin to learn humility:

> America needs to repent for allowing the gods of pleasure and wealth, of might and wisdom, to displace the God of Holy Scripture. Repentance leads through Jesus Christ to dependence on God and to his grace and blessing. Our failure to

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144 See Paul Boyer. *By the Bomb's Early Light*. New York: Pantheon, 1985.
145 "Shall We Fear the Unknown?" *Christian Century*, October 16, 1957. p. 1219.
146 "Some Hopes and Concerns of the Church in the Nuclear-Space Age," National Council of the Churches of Christ Policy Statement, December 5, 1957. NASA History Files.

> do so will ultimately hasten the real Armageddon – the day in which nations that have forgotten God will be destroyed.[147]

As the Space Age matured and the United States began to match and eventually surpass Soviet achievements in the heavens, other evangelicals began to express a point of view regarding spaceflight which was highly ambivalent. Their response was perhaps the simplest and most matter-of-fact given to the entire space endeavor. At a fundamental level, the whole astronautical affair meant very little to a mindset predicated upon a consistent anticipation of a prophesied and imminent apocalypse. Technological advancements were seen by such clergymen as spiritual lessons sent from God. In this sense, American evangelicals recognized the inherent spiritual drive of technology present since its inception – and blithely accepted its apocalyptic import. The millennial promise of the Space Age and the Nuclear Age was not what these technological eras could provide man in the way of abundance, but what these eras could provide humanity in the way of a rapturous, violent, and apocalyptic extraterrestrial deliverance. According to pre-Tribulation theology, popularized by John Nelson Darby, the elect were going to be whisked off of the Earth just prior to the end and only the wicked and the unbelievers would perish in the violent times to follow – so why bother worrying about the technological utopias promised on Earth when the Bible promised what would no doubt be a far grander utopia in Heaven? The ominous 'signs of the times' were just that – signs pointing to Biblical scripture – and thus their importance was educational, and thus immaterial. While the rocketeers sought to craft the metallic means of extraterrestrial transcendence off of a doomed Earth, American evangelicals scoffed at such a silly and

[147] Richard W. Gray, “God, America, and Sputnik,” in *Christianity Today*, December 9, 1957. pp. 16-17.

pointless exercise when God was going to effect such a transfer, in a much more glorious way. Humanity was a minute and unimportant actor in this inevitable cosmic drama.[148]

By this reckoning, figures such as influential evangelical radio personality and author M.R. De Haan had always seen the proliferation of nuclear weapons as a sign of the end-times. Armageddon was inevitable, no matter what steps were taken to create a more peaceful society. "No shelter… can protect us from the bombs being perfected today," he wrote, in a book published the same year the John Glenn made his first orbital flight. "The only way *out* is *up.*"[149] De Haan was not referring to the astronautical rapture dreamed of by von Braun, but the spiritual Rapture of Jesus. Evangelical Chicago pastor A.W. Tozer, who saw in the 'signs of the times,' the unmistakeable blueprint of the coming end of days, summed up the theological dilemma then confronting American Christians best when he wrote, a year after the launch of Sputnik, "The new concept of space has stunned us... our faith is staggering in an effort to equate the highly complex world of space and nuclear energy with the relatively simple world of the Bible and Christian devotion."[150] Tozer's answer was simple, and it was found in the Book of Revelation. "Looking through the telescope of the New Testament prophecy what do we see?" he asked.

> The shaking of the heavens and the earth, the panicky flight of helpless populations fleeing in terror before something that is taking place among the heavenly bodies, the ascending of pillars of smoke into what would now be called the stratosphere or the ionosphere, the thunderous passing away of the earth and all the related heavens to make room for a new heaven and a new earth that will be a fit home for a redeemed human race, the appearance from remote space of beings wholly unlike anything with which earth dwellers are familiar.[151]

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[148] For an in-depth look at American evangelical fatalism and hope regarding nuclear technology, see Paul Boyer's *When Time Shall Be No More*.
[149] M.R. De Haan. *Coming Events in Prophecy*. Grand Rapids: Zondervan Publishing Company, 1962. p. 119-120; cited in Boyer, *When Time Shall Be No More.* p. 125.
[150] A.W. Tozer. "A Christian Looks at the Space Age," in *Christianity Today*, October 13, 1958.
[151] Tozer, p. 14.

Space exploration for Tozer was a sign of the End-Times, and paradoxically, a hopeful sign.

After the Soviet Union promised in 1959 to land an unmanned spacecraft on the moon, the editors of *Christianity Today* asked 25 scholars for their perspective on space travel. While many began to express a more hopeful view of the endeavor, others were steadfast against the human invasion of heaven. Evangelical scholars were the most vicious in their condemnation of space travel. Fuller Theological Seminary professor Carl F.H. Henry saw space travel as satanic. "Fallen man vaunts his genius and power to disguise his moral nakedness and spiritual bankruptcy," he wrote.

> He shoots to the moon much in the spirit of proud Lucifer exalting himself against God. In fact, in the Bible, Satan is prince and power of the air. To bend the universe to God's purpose is man's divinely-given task. As sinner he exploits the universe instead; he reaches for infinity to vaunt his own glory.[152]

Henry's colleague at Fuller Seminary, Harold John Ockenga, claimed that space flight would not produce any millennial dawn for humanity, but instead a continuation of humanity's legacy of sin. "…[S]hould fallen man succeed in projecting himself to the moon or to any other planet," Ockenga told *Christianity Today*, "he will inject his sin, his hate, his violence into the new sphere… Space travel may well be a fulfillment of Acts 2:19 and Luke 21:25, which prophesy recognizable signs in the sun, moon, and stars before the second coming of the Lord."[153]

Seventh-Day Adventist evangelist George E. Vandeman saw the Earth itself as threatened by mankind's technology and believed the Day of Judgment, along with mankind's extraterrestrial rendezvous with Christ, were not far off. However Vandeman's Adventism championed the Earth even as fundamentalists championed the above. After Sputnik, Vandeman wrote, America "was a nation in shock… We realized that we were

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[152] "Moon Shot: Its Meaning to 25 Scholars," *Christianity Today*, October 13, 1958. p. 26.
[153] "Moon Shot: Its Meaning to 25 Scholars," p. 29.

actors in a technological revolution that would dwarf every other revolution into insignificance." Vandeman noted that only fourteen years separated the destruction of Hiroshima from the crash landing of the Soviet Lunik II spacecraft on the surface of the moon. "We had touched the universe," he wrote, "and its broken secrets had plunged us into nuclear and moral fear."

Vandeman believed that the immense technological advancements of the past few decades were a sure sign of the approaching "end to this world as we know it." Echoing the apocalyptic beliefs of other end times preachers, Vandeman asked, citing the Book of Revelation, "Could it be that we are approaching the time when God must intervene to 'destroy them that destroy the earth'?" Space colonization would be a reality, for Jesus was the first to prove it could be done. "It was Jesus Himself, you remember, who demonstrated the possibility of space travel and promised it to His followers," Vandeman wrote. "The laws of gravitation were circumvented as the Lord of glory was swept heavenward." When Jesus returned to the Earth, "past vast constellations, bursting into view with a brilliance of display…" he would whisk his believers into heaven, where they would wait out the purification of the Earth by fire. Vandeman noted that none of this miracle would require space suits or oxygen tanks.[154]

Despite the apocalyptic prognostications of some theologians, the dominant theological perspective on the technological achievements of the late 1950s and early 1960s was fundamentally optimistic. While the bomb and the rocket could certainly be seen as frightening portents of an imminent apocalypse, other scientific and technological achievements of the era promised heavenly realizations in the here and now. The gradual eradication of polio and smallpox, the wonder of television, the freedom of the

[154] George E. Vandeman. *Planet in Rebellion.* Nashville: Southern Publishing Association, 1960. pp. 137-49.

automobile, and now the promise of space exploration and colonization all served as bright spots even under threatening skies. By embracing modern technology, the mainline churches of the nation began to see the future as eschatological but not apocalyptic. For these churches, claims historian Robert Ellwood, the era was “a time when humanity was taking charge of its world, capable and prosperous as never before, and no longer needing to look for supernatural signs in the heavens.”[155] While evangelical theologians interpreted human entry into space as a literal fulfillment of various Biblical passages, theologians at the political center who contributed to the construction of what sociologist Will Herberg called "The American Way of Life" sought a reinterpretation of the Bible and its message in light of the insights provided by the Space Age.[156] This spirit of scientific and technological rapprochement between technology and a powerful mainline Christianity was a global phenomenon and was not just restricted to the American faithscape. Perhaps nowhere is this spirit better seen than in the reforms undertaken by the Catholic Church in Vatican II, in which the Holy See "opened up" to the world by approving conducting the Mass in the native vernaculars of the various nations. This "opening up" also involved a new and profound willingness by the Church to work within the world, on the world's terms, rather than from an outside perspective.

Those theologians with the closest ties to the space endeavor naturally attempted to closely ally the dawning promise of an age of high technology with the supposedly timeless message of Scripture. Hugh Dryden, Deputy Administrator of NASA from its inception in 1958 to his death in 1965, was also a lay minister at Calvary Methodist Church in Washington, D.C., and gave frequent sermons that had as their aim the

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[155] Robert S. Ellwood. *The Fifties Spiritual Marketplace*. Rutgers: Rutgers University Press, 1997. p. 188.
[156] Will Herberg. *Protestant, Catholic, Jew: An Essay in American Religious Sociology.* New edition. Garden City, NY: Anchor Books, 1960.

reconciliation of astronautical technology with the Christian faith. In 1950, Dryden was the Director of the National Advisory Committee on Aeronautics (NACA), the organizational forerunner to NASA. In a sermon delivered in March of that year, he gave voice to this sense among mainstream American religious leaders that a change in the character of faith was in the wind. "We thought the religion of our fathers and grandfathers would suffice for us," he said,

> But like their furniture, their modes of transportation, and their amusements, the value of their religious faith to us had declined to nearly zero. Only a faint nostalgia, a memory of their confident faith remains. We find that we must build this faith anew in our lives; that we must work and struggle and apply our knowledge and skills to the problems of our day.[157]

Dryden delivered several sermons at Calvary Methodist, each one brimming with more enthusiasm and vigor concerning the exo-millennialist promise of space.

It was not just those with ties to the American technological establishment who displayed an almost giddy optimism concerning humanity's seemingly imminent migration into space. Pope Pius XII expressed a millennial hope in the exploration of space a full year before Sputnik. Addressing the Seventh International Astronautical Congress at the Castel Gandolfo in Italy, Pope Pius XII blessed the transcendent goal of the assembled scientists and engineers. "The more we explore into outer space," the Pontiff said, "the nearer we come to the great idea of one family under the mother-father God...."[158] Pope Pius XII had always been a strong supporter of science during the Cold War. In his Christmas Message of 1953, entitled *Modern Technology and Peace*, the Pope unambiguously approved of the advance of modern technology, seeing it as "coming from God and capable of leading us back to God."[159] "Technology," wrote the

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[157] Hugh L. Dryden, "The Importance of Religion in American Life," sermon delivered at Calvary Methodist Church, Washington, D.C., March 12, 1950. NASA Historical Files.
[158] "Pope Blesses Assault on Space," *Los Angeles Mirror*, September 20, 1956.
[159] Cited in W. Norris Clarke, S.J. "Technology and Man: A Christian Vision," in *Technology and Culture*, Fall 1962. p. 434.

Pope, “has brought man’s domination of the material world to a pitch of perfection never known before... [N]ature itself seems to give an assent of satisfaction to what has been done in it...”[160] In the last year of his papacy, the ailing Pope even seemed to condone the colonization of space as a solution to overpopulation, and as a way of forgoing the widespread use of birth control. In a major anti-contraception speech, the Pope proclaimed it was “conceivable that the resources of outer space may help the world to support a population larger than what is now thought possible… No one can foresee what wonders might be performed outside the earth by a science that is only just beginning.”[161] Vatican officials quickly surmised that the Pope was referring to the industrialization of space, and not a modern-day Earth exodus.[162]

## CONFUSION REIGNS ABOVE AND BELOW

Although largely unrecognized as an important phenomenon during this era, the attempt of this Christian center to reconcile Biblical cosmology with an emerging and newly persuasive astronautical and scientific cosmology was at the very heart of the struggle of Christianity to maintain relevancy, especially amongst growing evangelization efforts in the Third World. Just as Kennedy's moon shot was an effort to "sell" American-style democracy and capitalism to nations "on the fence" in the Cold War ideological and propaganda battle, the various reforms of the Christian center were an effort to put forth a progressive and open face to similar religious constituencies tempted by the bold and self-professed atheistic and humanistic example of global Communism. Explaining the reasons for the seeming backwardness of Biblical cosmology to such constituencies became a difficult conundrum. The churches met this challenge with a

[160] Cited in Clarke, S.J. p. 433.
[161] Arnaldo Cortesi, “Pope Pius XII on Birth Control,” in *New York Times*, January 22, 1958. p. 29.
[162] Ibid.

variety of degrees of explanation, but almost always resulting in a partial or complete abandonment of the literal truth of such cosmology.

David H.C. Read, minister of the Madison Avenue Presbyterian Church in Manhattan, succinctly expressed this dilemma in an article in *Christianity Today* in the immediate aftermath of Sputnik. Read voiced a common concern that new exploits in space could seriously confuse and alienate congregants. "Men and women of today are bound to be enormously affected in their thinking about the universe and in their readiness to hear a supernatural message by the dazzling and imagination-baffling advances of science," he told readers of the widely circulated theological weekly. The flight of Sputnik, he prophesied, "arrives to symbolize this vague sense of living in a world where God is somehow less real, less near, less in control." As a result, Read felt it necessary to "re-establish some biblical insights…" First, he felt that ministers should "make it very clear that our belief in God is grounded on his sovereignty over all creation… [W]e must not now relegate the satellites to man's control and push our claims for God outward to the stars." Secondly, and perhaps most tellingly, Read warned ministers that "we must be careful in our use of the language concerning the Incarnation.

> We must be factual and historical in our proclamation of the events in which God was savingly revealed to men, but avoid suggesting that the divine world can itself be located in space and time. The Ascension, for instance, we believe is an historical as well as a spiritual fact, but the use of spacial imagery can be confusing to the theologically illiterate. We should guard ourselves against such questions as 'in what direction did [Jesus] go and in what part of the stratosphere is he to be found?[163]

Read was adamant about warning his fellow theologians that they should guard against equating space with heaven. Just as he found congregants asking about Jesus's galactic destination after the Ascension a bit unnerving, he ordered that "the angelic world from which the Annunciation broke upon our earth must not be confused with

[163] David H.C. Read. "Sputnik and the Angels," *Christianity Today*, December 4, 1957. p. 10.

some portion of discoverable space."[164] The dawning realization of the true geography of heaven had the potential to seriously upset a Christian cosmology and lexicon which, although battered by the Scientific Revolution, still worked for the Earthbound mind.

The most radical capitulation to cosmological reality, however, came from theologians in the controversial "death of God" movement. In 1963, English bishop John A.T. Robinson's book *Honest to God* provoked a firestorm of theological controversy when he suggested that God, as Nietzsche had claimed at the dawn of the twentieth century, was "dead." Soon, Robinson and like-minded theologians became associated with a nascent "Death-of-God" movement, which posited, as its main thesis, that the God of the Bible – the omniscient, Fatherlike, all-powerful and occasionally angry sky God – had, in essence, "died" at the crucifixion of Christ. Christ's resurrection, they maintained, signaled the death of the jealous and angry God of the Old Testament, because, in their reasoning, Christ's boundless forgiveness had released his Father from his duties to Earth. The Christ of love and forgiveness had usurped the capricious God of the Old Testament.

Whatever the theological implications of God's supposed death, one of the major "proofs" of the possible truth of Death of God theology was the sudden irrelevancy of Biblical spatial language in the face of Space Age achievements and knowledge. The "earth" of the 1960s was a very different earth than that described in the Bible, noted Robinson. And with the emptying of the holy heavens by science and spaceflight, the "heaven" of Christian teachings had undergone a similarly radical and tumultuous reinterpretation. Robinson noted in his book that the "three-decker" universe of Biblical times – split between heaven, earth, and hell – was not only antiquated in the light of Copernican thought and astronautical reality, but just plain wrong. In centuries since the

[164] Read, p. 10.

authorship of the Bible, maintained Robinson, the God previously conceived as being literally and physically "up there" had been reimagined as instead being spiritually and metaphysically "out there." This reimagination had still not vanquished the old way of thinking, however. Many still thought of God as literally "out there," as opposed to spiritually or conceptually "out there." The Space Age, wrote Robinson, had proved quite difficult for the literal interpretation – that perspective held most closely by evangelicals in the United States. "[T]he number of people who instinctively seem to feel that it is no longer possible to believe in God in the space age shows how crudely physical much of this thinking about a God 'out there' has been," wrote the bishop. "…[I]n fact the coming of the space age has destroyed this crude projection of God – and for that we should be grateful. For if God is 'beyond,' he is not *literally* beyond anything." In regard to the Earth, Robinson noted that by the Elizabethan era, the concept of a Hell inside the Earth had also been largely discredited, although it still possessed significant metaphorical power. The Bishop regarded it as a "tragedy" that "no effective translation into terms of the God 'out there' was found for the Devil and his angels, the pit and the lake of fire." Such a worldview, the Bishop maintained, had resulted in a disdain for the Earth in Western culture that bordered on the criminal.[165]

## THE COLD WAR PROPAGANDA BATTLE OVER GOD AND SPACE

Spatial confusion within Western Christianity permeated not only theological discourse in the late 1950s and 1960s, but also Cold War political discourse. The Soviet propaganda machine was only too eager to pounce on this sense of bewilderment in Western faith and quickly capitalized on the global perception that atheist Communism might have claimed the vanguard of the future in its extraterrestrial triumphs. The history

[165] John A.T. Robinson. *Honest to God*. London: SCM Press, Ltd., 1963.

of the Soviet connection of space exploration and atheism had its roots as far back as 1953, with the ascension of Nikita Khrushchev. Khrushchev's rise to power saw the beginning of a round of Soviet antireligious propaganda and persecution which rivaled in intensity the campaign by the Leninist "Soviet League of the Militant Godless" immediately following the October Revolution. In the earlier campaign, church leaders and ministers were relegated, under the July 1918 Constitution, to second-class citizens, lumping them with "capitalists, merchants, former members of the police, criminals, and imbeciles."[166] A year after becoming First Secretary of the Communist Party (and a year after "under God" was added to the U.S. Pledge of Allegiance), Khrushchev ordered a vigorous crackdown on religious worship throughout Russia. However, the campaign faltered within 100 days due to popular discontent and was abandoned. Instead, the regime relied on atheistic propaganda during the launch of Sputnik to express the official Soviet view. However, in 1959, Khrushchev fully implemented the plan he had started earlier, and a crackdown on religion as virulent as that in the early years of the Soviet republic was launched. Thousands of churches were closed and religious worship was again driven underground. Accompanying this 1959 crackdown were the first hints of a concerted effort by the Soviets to characterize space travel as a necessarily atheist activity.

In January 1959, Moscow Radio broadcast the comments of the head of the "scientific-atheistic" section of the Soviet journal *Science and Life,* Y.T. Fadeyer, who asserted that rockets and space travel refuted the existence of God. According to Fadeyer, religious writings that claimed that man could only ascend into heaven through divine intervention were proved irrevocably wrong by human space triumphs. "[I]n the

[166] Daniel Peris. *Storming the Heavens: The Soviet League of the Militant Godless*. Cornell University Press: Ithaca, 1998. p. 25.

age of jet aircraft and high-altitude rockets, artificial earth satellites and interplanetary ships," Fadeyer said, "it is comical to argue that man cannot reach the heavens. The religious legend about the impossibility of flying in the air and the cosmos at will has suffered a complete fiasco." Fadeyer explained what he perceived to be the religious counter-argument. "To find a way out of this situation some religious preachers claim that the development of aviation and rocketry is taking place not at the will of man, but by divine will…" For Fadeyer, this divine blessing of spaceflight was "in direct contradiction to all so-called sacred scriptures and religious sermons which have been preached throughout the centuries."

Continuing with his line of reasoning, Fadeyer claimed that if spaceflight was previously against God's will, and was no longer against God's will, then "the divine will has undergone a change" and this meant "the All-Highest is not fitted with absolute wisdom and knowledge" or worse, is forced to "reconcile Himself to the impudent feats of human beings," meaning that He "is not almighty."

But Fadeyer did not stop there. Since Soviet Sputniks could detect many phenomena which human beings could not through their natural sensory organs, including x-rays, cosmic rays, and magnetic fields, then Fadeyer concluded that "if supernatural beings really existed they would long since have been detected by powerful means of scientific research." Since scientific instruments detected no angels and no God, then Fadeyer concluded that they didn't exist. "The fact that satellites and rockets have not detected the All-Highest, angels, and so on, bears testimony against religious convictions and strengthens disbelief in God."[167]

It is not surprising that statements like Fadeyer's provoked an equal and opposite counter-campaign among American theologians. Methodist Reverend Ralph W.

[167] "Space Exploration Refutes God," in *New York Times*, January 23, 1959. 3:3.

Sockman, in a sermon two days after Fadeyer's comments, gently chastised the Soviet scientist. "[W]e almost have to smile at the childishness of Soviet scientists who assert that the failure to find angels and spirits in heavenly space tends to strengthen disbelief in God… Of course rockets can never find supernatural beings or other detectable evidences of God because, as Jesus said, 'God is Spirit and those who worship must worship in Spirit and Truth."[168] Sockman's answer was to deny the spatiality of God altogether and make God "spirit." While this may have worked for some, Biblical cosmology was pretty explicit about the location of God. To believe Sockman was to deny Scripture, at least to a literalist.

For the rest of the space race, the issue of God in relation to space travel cropped up again and again, not only in the protestations of theologians, but in the overtly religious language employed by American politicians, NASA officials, astronauts, and scientists alike. This response to the Soviet challenge of an atheist cosmos had a dual effect. On one hand, it served to cast the space endeavor in explicitly Judeo-Christian terms, within a framework that the ideology of exo-millennialism found natural and appealing, given their common roots. It created a natural alliance between a more technologically accepting brand of American Christian fundamentalism and the space endeavor, evidenced by the prevalence of Biblical literalism within NASA and the space community itself. At the same time, exo-millennialists saw a theological manner of allying their perspective with the American Christian mainstream, and thus hoped to create a common ideation of space exploration based in Biblical justifications. On the other hand, this alliance was positioned on extremely shaky ground. The center of American society in the 1960s was not holding; the common center of American life was quaking as a result of an intense pressure caused by the collision of deep and

[168] "Satellites and God," in *New York Times*, January 26, 1959. p. 52:5.

subterranean fault lines in the national body politic – fault lines of race, gender, anti-militarism and religion. The futuristic space program, with its transcendent dreamers, rapidly became associated with a bygone era with little relevance in a rapidly changing contemporary climate. To talk of God and space technology, in the 1960s and 1970s, was increasingly tantamount to associating God with intercontinental ballistic missles, napalm, Huey helicopters, M-16s, industrial and chemical pollution, nuclear weapons, chainsaws, asphalt, and all the other manifestations of what some called the Establishment, and others called the "system" or the "Machine." At the same time, the rhetoric of the American frontier, which the space program had deeply allied itself with, endured a similar decay of persuasion. The frontier, in the 1960s identified with the cold, dead void of the moon and empty space, began to seem like a not very exciting or welcoming place to be. The natural alliance between a philosophy of Earth transcendence through technology and the Biblical God, so common among the rocketeers, became a marriage of convenience, but as the 1960s wore on, this union began to become, for many Americans, a marriage from hell. The frontier, in a similar fashion, became not the place of dreams and conquest, but hell itself as well.

At the introduction of the Mercury Seven in April 1959, NASA Director of Information William F. Bonney asked each of the astronauts about their religious beliefs. The atheist pronouncements by the Soviets were already widely reported in the press, and the astronauts responded by declaring their Christian denominational allegiance. Each of them seemed a bit uncomfortable with the question, knowing perhaps that it was being used as a propaganda tool to counter Soviet atheism. Cooper was the first to answer. “Yes, for myself I am a Christian, a Methodist, and I think religion is definitely with those who are Christians a sustaining aid.” Bonney turned back to Carpenter so that he could state his answer for the record. “If the question involved religious faith,” Carpenter

said, “I have that, although I don’t call on it particularly associated with this project. I am merely a faithful church-goer, where it is possible.”[169]

John Glenn responded more forcefully than Carpenter, and gave a nuanced answer. “…I am a Presbyterian, a Protestant Presbyterian, and take my religion very seriously, as a matter of fact. I have taught Sunday school… We are very active in church work…” Glenn described how his faith related to his astronautical duties: “My own feelings, as far as a religious background on this, are very easy… I was brought up believing that you are placed on earth here more or less with sort of a 50-50 proposition, and this is what I still believe."

> We are placed here with certain talents and capabilities. It is up to each of us to use those talents and capabilities as best you can. If you can do that, I think there is a power greater than any of us that will place the opportunities in our way, and if we use our talents properly, we will be living the kind of life we should live.
>
> This is the way I look at this whole program. I look at it, if I use the talents and capabilities I happen to have been given to the best of my ability, I think there is a power greater than I am that will certainly see that I am taken care of if I do my part of the bargain.[170]

Glenn’s comments established him as the most philosophical (and politically savvy) of the group, and provided a clear balance between faith in God and reliance on his own abilities. Of all the answers that day, Glenn’s comments seem in retrospect to have been most designed to directly counteract the Soviet rhetoric concerning the existence of God. Glenn maintained a belief in a higher power, without sacrificing his free will and natural talent.

The remaining four of the Mercury Seven rattled off their Protestant affiliations. Grissom: “I consider myself religious. I am a Protestant and belong to the Church of Christ.” Schirra: “I have followed the Episcopal Church as my faith.” Shepard: “…I of

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[169] “Press Conference Presenting the Astronauts,” April 9, 1959. p. 64. NASA Historical Files.
[170] “Press Conference Presenting the Astronauts,” p. 65. NASA Historical Files.

course am a Christian and attend church…. I attend the Christian Science church regularly." Slayton: "…I am a Lutheran, and I go to church periodically." The monotonous litany of professions of Christian faith, by the last of the batch, began to sound as if the astronauts were being asked whether they were Communists.[171]

Astronaut Wally Schirra attempted to modify his answer by expressing the Seven's collective faith in modern technology and technical progress. For Schirra, it was not the old-time religion which sustained him but instead a belief that his activities were helping to push forward the extraterrestrial destiny of mankind. "I think I should like to dwell more on the faith on what we have called the machine age," Schirra told the audience. "We have the faith in the space age… All of us have had faith in mechanical objects." Alan Shepard concurred, and seemed cognizant that the statements of religious faith on the part of the astronauts were going to be used to contrast the American program with the Soviet one. "I think pertinent here is the entire philosophy of the Project Mercury…" Shepard said. "…this project is not in direct competition with any other agency as we know it. The project is described to you people, and to us, as merely one step in the evolution of space travel…. It is not a technical race, it is a step in the evolution of space travel." By also expressing faith in the utopian ideals of the Space Age, Schirra and Shepard asserted the internationalist and global aim of the Mercury program.[172]

In September 1961, a month after cosmonaut Gherman Titov spent over 24 hours in a space capsule, orbiting the Earth a record 17 times, Nikita Khrushchev gave an interview to C.L. Sulzberger of the *New York Times*. The swaggering, bragging Khrushchev made it a point to mock not only the American space program, but God

[171] "Press Conference Presenting the Astronauts," pp. 65-66. NASA Historical Files.
[172] "Press Conference Presenting the Astronauts," p. 66. NASA Historical Files.

Himself, and his comments seemed designed to exploit the cosmological conundrums being encountered by American theologians – and the American space program – in their journeys into the heavens. In fact, Khrushchev seemed to be engaged in a low-level form of psychological warfare. "As to Paradise, we have heard a lot about it from the priests," Khrushchev joked to Sulzberger, "So we decided to find out for ourselves." The Soviet Union, Khrushchev told Sulzberger, had sent up Gagarin and Titov to find out about heaven. Gagarin, according to Khrushchev, reported that "it was pitch dark there… no Garden of Eden, nothing like Heaven." Titov was sent up for a longer period of time because Gagarin was there only 90 minutes. "[Gagarin] might have missed Paradise," Khrushchev said wryly. "We told [Titov] to take a good look. Well, he took off and came back and confirmed Gagarin's conclusion. He reported there was nothing there."[173]

Khrushchev's taunting of God only further compelled the American space program to adopt Judeo-Christian rhetoric. The Soviet claim that there was no God to be seen during spaceflight was, of course, teasing on an international scale. Yet at the same time, the claim could not go unanswered. Two basic responses to the Soviet ridicule became common. The theological response was similar to that given by Reverend Sockman two years earlier: "God was Spirit," and thus not detectable in space, so Soviet assertions were characterized as either the product of idiots, fools, or diehard materialists. In 1962, almost in the shadow of the recently constructed Space Needle in Seattle, and under the auspices of a theological conference dedicated to the exploration of "Space Age Christianity," the Reverend William G. Pollard, Executive Director of the Oak Ridge Institute of Nuclear Studies, also thought he had found an appropriate answer to the Soviet challenge to Biblical spatiality. "In order to really reach heaven," claimed Pollard.

[173] C.L. Sulzberger. "Foreign Affairs: Paradise and Old Noah Khrushchev," in *New York Times*, September 9, 1961. p. 18.

"Mr. Khrushchev and his scientists would have to learn how to shoot rockets perpendicular to the whole space-time continuum, right out of our domain of existence. But there is no way in which science can learn or teach us how to do that."[174] Pollard was one of the most prominent defenders of the technologization of American Christianity during the Space Age. In abstracting God to this "other" domain of existence, theologians like Pollard admitted that they did not necessarily subscribe to the Biblical language and metaphor which continually situated Yahweh as a sky-God. In the new Space Age, the ideas of up and down came to mean little, so events like Jesus's "ascent" into heaven and the common practice of looking to the sky to beseech God's favor became, even in the eyes of mainstream American theologians, antiquated. In a battle between the poetic language of the Bible and the scientific language of space, many theologians deferred to NASA.

John Glenn's flight in February 1962 provided the first opportunity for America to flex its theological muscle outside the Earth's atmosphere. On his return to Earth, Glenn appeared before the Senate Aeronautics and Space Sciences Committee, where the questions asked of him seemed more designed to score propaganda points in the United States's "God in space" battle with the Soviets, than to elicit any scientific or practical human spaceflight knowledge. Oklahoma Senator Robert S. Kerr, the committee chairman, opened the session by praising Glenn "on his spirit of reverence and his faith in God… [B]y his example and his performance, Colonel Glenn has made a tremendous contribution to the spiritual uplift of so many people in this nation and around the world."[175] Glenn himself denied praying in space – he was "too busy," he admitted – but the astronaut claimed for himself an ever-present faith, contrasting his beliefs with a

[174] Reverend William G. Pollard, "Christianity in the Space Age," in *Space Age Christianity*, Rev. Stephen F. Bayne, Jr., ed. Morehouse-Barlow Co.: New York, 1963. p. 32.
[175] "Remarks of Astronauts John Glenn to Congress," *New York Times*, March 1, 1962. p. 15.

"fire-engine type religion," in which God was called on in an emergency and then "put… back in the woodwork." God was much bigger than space, Glenn told the committee, and "I think He will be wherever we go."[176]

President Kennedy made propaganda hay out of Glenn's comments at the 10th Annual Presidential Prayer Breakfast the following day. He directly connected the spiritual implications of Glenn's heavenly flight with the crux of America's battle with the Soviets, adding an ominous and apocalyptic paraphrase from Scripture: "We see the storm coming, and we believe He has a hand in it, and if He has a place and part for us, I believe that we are ready." Religion in the Cold War, the President told the assembled Congressmen, diplomats, military brass and officials, "is the basis of the issue which separates us from those who make themselves our adversary."[177] He contrasted Glenn's flight with that of the Soviet cosmonaut Gherman Titov the previous year. "I believe yesterday we saw an interesting contrast in the response which Colonel Glenn made as to whether he had prayed, and he said that he had not, that he made his peace with his Maker many years before, and the statement made by Titov in which during his flight, as he flew over the Soviet Union he realized, he said, 'the wonders of the Communist system.' I preferred Colonel Glenn's answer," Kennedy admitted,

> Because I thought it was so solidly based, in his own life, in his activities in his church, and I think reflects a quality which we like to believe and I think we can believe is much a part of our American heritage.[178]

The debate escalated in May when Soviet cosmonaut Gherman Titov toured the United States. The American press repeatedly asked Titov about his flight, and at the Seattle World's Fair, Titov firmly proclaimed his disbelief in God to a crowd of reporters. "I

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[176] "God Bigger Than Space, Astronaut Tells Senators," *Catholic Standard*, March 9, 1962.
[177] "Presidential Prayer Breakfast," *New York Times*, March 2, 1962. p. 3.
[178] John Fitzgerald Kennedy, "10th Annual Presidential Prayer Breakfast," *Public Papers of the Presidents of the United States: John Fitzgerald Kennedy, 1962*. March 1, 1962. pp. 175-76.

don't believe in God," Titov told reporters. "I believe in man -- his strength, his possibilities, and his reason… Sometimes the people say the God is living there," in space, "But I haven't found anyone there."[179] X-15 Pilot Major Robert White rebuked Titov two months later, calling the cosmonaut's intellect "rusty from misuse." "Scientific discovery," claimed White, "rolls back the doors of the unknown and leaves the human in awe of the vastness of the universe.... This world of discovery... is small in comparison with God's knowledge."[180]

Back and forth the sparring continued. After Soviet cosmonauts Pavel R. Popovich and Andrian G. Nikolayev completed a historic double flight aboard *Vostok 3* and *Vostok 4* in August 1962, they also taunted the American space program's endorsement of God. Asked during a post-flight television interview whether either of them had seen God in space, Popovich smiled and replied, "Yes, I saw God. I asked him his name and he replied 'Andrian Grigoryevich Nikolayev.'" At that point Yuri Gagarin, also on the program, piped in by contrasting the speed of their spacecraft with the speed of God. "The real God, the true God, has very little speed," claimed Gagarin, "He's driving a troika."[181]

With those comments, the Space Age religious battle heated up. Both the Vatican and the Islamic newspaper *Al Akhbar* slammed the cosmonauts. Anis Mansour, an editor at the Cairo newspaper, called Popovich and Gagarin "naïve, ignorant, and influenced by a way of thinking which is other than their own… Where did they expect to see God? Sitting down? Standing up? Near something? Away from something?" The Cairo newspaper's frustration gave way to an incisive critique of the Soviet mindset. "If

[179] "Titov Puts Belief in Man Alone," *Washington Post*, May 7, 1962.
[180] "X15 Pilot White Scores Titov on 'God in Space'," *Boston Record American*, July 26, 1962.
[181] "Russian Astronaut Says He Saw No God," *New York Times*, August 24, 1962.

Gagarin and his fellow spacemen in the Communist Party are influenced by the machines they invented, we should warn them against worshipping these machines."[182]

Several military officers connected to the United States space and missile program declared, at the 1963 convention of the Military Chaplain's Association, that "there was no room for agnostics in space." Colonel Sam Bays of the Air Force claimed, at that same conference, that "100 percent of Air Force personnel" who failed to meet the exacting standards set down by the space program "did not practice or profess a definite religious faith." The gathered officers did not specify which of the Earth's faiths would be acceptable for entry into space, but one can probably make a decent guess. When Mercury astronaut Gordon Cooper flew into space aboard *Faith 7* in May of 1963, (Cooper chose the name for the capsule himself), he upped the religious ante in the superpower spiritual war. Unlike Glenn, who denied praying in space, Cooper made it a point to bring along a tape recording of a prayer, this one explicitly Christian. Cooper also carried a Christian flag with him on his voyage. Cooper's actions and prayer marked a clear departure from the precedent Glenn had set the previous year. Glenn had mentioned God, an acceptable nod to the "American Way of Life," but Cooper had made his *Faith 7* flight specifically Christian.

Even as the American space program became increasingly identified as anti-atheist and humble before God, the major American religious denominations which dominated mainstream American spiritual life in the 1960s were losing not only members, but their credibility with the public. Between 1965 and 1975, the Episcopal Church in the United States lost over a half million members. The United Methodist Church lost over a million.[183] Between 1958 and 1975, Catholic church attendance

[182] "Red Spacemen Handed Sharp Islamic Rebuke," *Washington Star*, October 15, 1962.
[183] *Yearbook of American and Canadian Churches*, 1977.

dropped from 74 percent to 56 percent. Protestant church attendance, across the board, dropped from 44 to 37 percent.[184] And this was in an era of skyrocketing population and high birthrates. Religious scholars such as Robert Bellah have attributed this movement away from the mainstream churches to the increasing encroachment of science, technology, and bureaucratic organization. As the churches tried to reinvent themselves to adapt to the supposedly radically new Space Age, and compete with science and materialism for the hearts and minds of the nation and the world, they ironically jettisoned the very idealism and substance which provided their congregants with meaning. In other words, the more America and the churches accepted the nation's move to technocracy, the more the citizens decided to vacate their pews.[185]

Instead of seeking comfort in the pews of their parents, Americans began what historian of religion Robert Wuthnow called a process of "seeking."[186] Many moved into more conservative and fundamentalist denominations, like the Assemblies of God and the Church of the Nazarene, whose memberships grew by a combined 34% between 1965 and 1975.[187] According to scholar Dean Kelley, conservative and fundamentalist denominations, with their comparatively strict belief systems and unwillingness to compromise in the face of theological challenges, better met the need for comfort and simplicity their congregants were seeking.[188] On the other end of the political and social spectrum, many Americans left the traditional centrist churches to participate in a host of

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[184] Jackson W. Carroll. "Understanding Church Growth and Decline," in *Theology Today*, Vol. 35, No. 1, April 1978. p. 71.
[185] See Robert Bellah. "The New Religious Consciousness and the Crisis in Modernity," in *The New Religious Consciousness*. Charles Y. Glock, Robert Bellah, Randall H. Alfred, eds. Berkeley: University of California Press, 1976.
[186] See Robert Wuthnow. *After Heaven: Spirituality in America Since the 1950s*. Berkeley: University of California Press, 1998; *The Restructuring of American Religion: Society and Faith Since World War II*. Princeton: Princeton University Press, 1988.
[187] Cited in Jackson W. Carroll, "Understanding Church Growth and Decline," in *Theology Today*, Vol. 35, No. 1, April 1978. p. 71.
[188] Dean R. Kelley, *Why Conservative Churches are Growing*. New York: Harper & Row, 1972.

alternative spiritual expressions, ranging from Zen Buddhism to Transcendental Meditation to Scientology. Still others began participating in the civil rights and anti-war movements of the day, movements which offered a form of cross-denominational spiritual expression, replete with rituals, a sense of belonging, and a vision of human destiny on Earth. With the polarization of society between a religious left and a religious right, more and more Americans began adopting a religious perspective suspicious of the formerly sacrosanct center. As the anti-Communist Judeo-Christian center of American religious life dissolved in the 1960s, so too did the power of its rhetoric, both on Earth and in space. By continuing to rely on this rhetoric, the space program was placing its vision of the future on very shaky ground. It was during this period of religious and cultural polarization that the first photographs of the Earth from space began to appear in magazines, books, and on television.

While images of the whole Earth as seen from deep space had been available since 1966, they were not widely published. In general, the quality of such early images was poor. Furthermore, such images were the product of unmanned space probes. It was not until the flight of Apollo 8 in December 1968 that the first high-quality images of the entire Earth, as seen from cislunar space, became widely available to the American public. These photographs appeared at a moment in the history of space exploration and at a moment in American history which can best be described as desultory. Polls consistently showed a decline in public enthusiasm and support for the moon missions, with most respondents claiming that the billions spent on astronautical technology would better be spent on social programs. At the same time, the Vietnam War took a toll on the

public's support for government-sponsored expeditions in general. Public trust in government and in the American dream began to sour.[189]

The Apollo 8 flight, then, resulted in a unique spiritual paradox. The photographs of the planet as seen from the outside revealed the true astronomical position of the Earth. Apollo 11 astronaut Michael Collins would later be struck by the fact that the Earth seemed so small from the distance of the moon that he could "blot it out of the universe simply by holding up my thumb."[190] Through the Earth photographs, the home planet finally appeared as the inconsequential and peripheral celestial mass which Copernicus had predicted centuries before. Yet, at the same time, in the midst of the propaganda battle with the Soviets, astronauts and NASA had grown accustomed to proclaiming the existence of God or God's extraterrestrial presence. In doing so on the Apollo 8 mission, the astronauts invoked an ancient Biblical cosmogony borne in an age when the Earth was considered the indisputable center of the cosmos.

Prior to the Apollo 8 flight, the Public Affairs division at NASA had briefed the astronauts on their live television appearances. “There will be more people watching these shows than have ever listened to a single human being in all of history. Say something appropriate,” they were told.[191] On Christmas Eve, the astronauts were given a chance to give their personal reflections on the meaning of their flight to millions upon millions of people on Earth.

The astronauts ended their broadcast by reading the first nine verses of Genesis, as the sun rose for the tenth time over the lunar landscape. "In the beginning," Apollo 8 crew member Bill Anders began,

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[189] David E. Nye, "Don't Fly Us to the Moon: The American Public and the Apollo Program," in *Foundation*. No. 66. Spring 1996.
[190]Quoted in Tim Ferris. *Spaceshots: The Beauty of Nature Beyond Earth*. New York: Pantheon, 1984. p. 106.
[191] Quoted in Andrew Chaikin. *A Man on the Moon*. Penguin, 1994. p. 120.

> God created the heavens and the earth. The earth was without form and void, and darkness was upon the face of the deep; and the Spirit of God was moving over the face of the waters. And God said, 'Let there be light'; and there was light.

Jim Lovell continued:

> And God saw that the light was good; and God separated the light from the darkness. God called the light Day, and the darkness he called Night. And there was evening and there was morning, one day. And God said, "Let there be a firmament in the midst of the waters, and let it separate the waters from the waters." And God made the firmament and separated the waters which were under the firmament from the waters which were above the firmament. And it was so. And God called the firmament Heaven. And there was evening and there was morning, a second day.

Frank Borman took over, continuing to read from the ancient passage, which described a cosmography which was, by 1968, almost completely alien to modern man:

> 'And God said, "Let the waters under the heavens be gathered together unto one place, and let the dry land appear." And it was so.' And from the crew of Apollo 8, we close with good night, good luck, a Merry Christmas, and God bless all of you – all of you on the good earth.[192]

Three days later, Apollo 8 splashed down in the Pacific.

The Genesis reading was the culmination of the superpower theological battle which had been fought throughout the decade. By invoking Biblical cosmogony, the astronauts and the United States were symbolically ferrying the creation story of Christianity, Judaism, and Islam into a newly desacralized heaven. To an outer space divested of angels and an immediate God, the astronauts actively brought Biblical faith. Whereas the Soviet space program would have undoubtedly characterized the moon mission as a triumph of liberated man, the astronauts used the occasion to invoke the supremacy and omnipotence of God.

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[192]"Excerpts From Radio Conversations Between the Apollo 8 Crew and Houston," in *New York Times*. December 25, 1968. p. 36.

But the Genesis reading, however moving some Americans may have felt it to be, rang a slightly discordant note. The uneasy centuries-old relationship between religion and science regarding the age of the Earth and the universe could not help but be recalled during such a reading. The Biblical account claimed God created the universe in seven days; modern geology and astronomy suggested a somewhat longer timeline. While it may have seemed appropriate for some devout Christians, and equally as inappropriate for atheists, the great majority of humanity must have been left a bit perplexed at what exactly was meant by such an invocation at such a controversial juncture. Wasn't the technological achievement of the moon a relegation of the Genesis creation story to the status of mere myth and poetry? It was bit dissonant to read such a passage while the moon's cracked and ancient surface bore immediate and irrefutable testament to the effects of millennia and millennia of astral bombardment, and not seven days of divine will, with one day off for rest.

The Genesis reading was a problematic extraterrestrial invocation for a project ostensibly performed on behalf of all "mankind." As the culmination of the superpower "God in space" debate, the reading pointed to both the strengths and weaknesses of NASA's decision to frame the program in an uninspiring rhetoric of interdenominational "God-speak." The professed non-controversial Judeo-Christian piety of the astronauts ruffled no feathers, and yet also won no converts. Such vague religious rhetoric played to the typically Midwestern, Christian, and patriotic base which inevitably supported American military and technological adventures both on Earth and in space. The flood of theological justifications for the space adventure from mainstream religious leaders and the American media served to provide the program with a patina of God-fearing anti-atheistic Communism which Nixon's "silent majority" favored as an organizing ideology. In a sense, such rhetoric could then be seen as a strength, a way of solidifying the

religious and political base behind space exploration. To invoke God served to dispel the Communist-humanist justification for the conquest of space for some, at the same time that it made it seem parochial and narrow-minded for others.

While the Christmas Eve Genesis reading may have been moving for some on Earth, the astronauts' disdainful comments about the moon and the implication of such comments for the future of manned spaceflight would prove to be the most enduring legacy of the flight. The desolation of the moon, and the brilliance of the Earth, took Commander Borman aback. Historian Andrew Chaikin wrote of Borman's reaction, "To see the moon so desolate, looking like the earth must have looked before life – or how it would look after nuclear war – was more sobering than he could have anticipated."[193] Borman himself called the sight of the Earth rising over the bleak lunar surface "the most beautiful, heart-catching sight of my life, one that sent a torrent of nostalgia, of sheer homesickness, surging through me. It was the only thing in space that had any color to it."[194] Borman's words to the planet's people that night regarding the receding moon gave no support to the space endeavor, and actually served to discredit the exo-millennialist dreams of von Braun. In a somber and deliberate tone, he delivered the first-in-history human reflections on the moon from orbit. His remarks were exactly the opposite of the bold pioneering spacespeak so common to the program "[T]he moon is a different thing to each one of us," he began.

> I think that each one carries impressions of what he's seen today. I know my own impression is that its a vast, lonely, forbidding type expanse of nothing. It looks rather like clouds and clouds of pumice stone. And it certainly does not appear to be a very inviting place to live or work.

Borman's words were unfailingly honest. All of the astronauts knew about the telecast ahead of time and planned carefully what they were going to say at this epochal

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[193] Andrew Chaikin. *A Man on the Moon*. New York: Penguin, 1994. p. 120.
[194] Frank Borman. *Countdown: An Autobiography*. New York: William Morrow, 1988. p. 212.

moment. In one sentence, the Commander of the first manned spacecraft to orbit the moon had dismissed as desultory any future human habitation or colonization of the lunar surface. Borman then turned to Lovell and asked him what he had thought most about. Lovell delivered a similarly dismissive view.

> Well, Frank, my thoughts were really somewhere in the vast loneliness up here on the moon. It's awe-inspiring and it makes you realize just what you have back on earth. The earth from here is a grand oasisin the great vastness of space.

The fact that two of the three astronauts aboard the first moonbound spaceship would utter remarks completely at variance with the triumphalist rhetoric so common in spaceflight circles is quite remarkable. The effect of their remarks in the press was immediate and substantial. Editorial coverage of the epochal comments tended to focus on Lovell's poetic words concerning the Earth, taking his passage to reveal a deeper truth regarding the trajectory of the space program. Most editorials in major American newspapers in the days surrounding the Apollo 8 flight stressed the view of the Earth and its import for environmental and social problems below. "To see our planet through the astronauts' TV camera, a gleaming sphere standing lonely in space," the *Christian Science Monitor* claimed, "helped us share the new perspective those men have gained." The perspective of Borman, Anders, and Lovell taught humanity one lesson, according to the *CSM*: "We should cherish our home planet. Men must conserve earth's resources. They must protect their planetary environment from spreading pollution. They have no other sanctuary in the solar system."[195] The *New York Times* expressed a nearly identical sentiment, invoking the now-imbedded Earth-space mantra which characterized exo-millennialist opposition during the era. "Why cannot the same mobilization of resources be utilized to meet the nation's real problems here on earth?" they asked. "If it is possible to send men to the moon, is it not possible to give all our people decent housing, adequate

[195] "Another giant step," *Christian Science Monitor*. December 28-30, 1968.

schooling and proper medical care, to cleanse the nation's air and water of pollutants, and to save the natural wonders of forest, stream and canyon now threatened by the voracious appetite of an expanding population?"[196] The *Washington Star* invoked Pope John XXIII's reference to the moon rendezvous as a "millennial event," and allowed themselves to hope that in the Earth vision and its ecological overtones was the true world-unifying achievement of the Space Age. "Already there is evidence that men of differing views have reacted to…. this millennial event with a realization that human life and the earth itself are vulnerable to man's wildly accelerated technical progress and that they are, taken together, eminently worthy of preservation," the editorial read. "The world will not change overnight. The millennium has not arrived – nationalism will be with us yet a while. But the direction of history may have shifted course ever so slightly toward ultimate sanity."[197]

After the New Year, the Apollo 8 astronauts appeared before a joint session of Congress. Invited to deliver an address, the astronauts chose the commander, Frank Borman to sum up their feelings. In the presence of so many dignitaries, Borman chose to qualify the disparaging comments about the moon Lovell and himself had made during the mission. "[Y]ou recall that we described the lunar landscape as being 'forbidding,' 'gray,' 'unwelcome,' 'eternal loneliness,'" he said. "Yet, as we were coming back to earth, we were all contemplating the fact that hopefully in a few months a human being will tread on that landscape, and in a few years, we will have an international community of exploration and research there…"[198]

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196 "Return from the Moon," *New York Times*, December 28, 1968.
197 "Six Days That Could Change the World," *Sunday Star (Washington)*, December 29, 1968.
198 "Joint Meeting of the Two Houses of Congress to Receive the Apollo 8 Astronauts," House of Representatives, January 9, 1969. p. 4. Attachment A. NASA Historical Files. (Congressional Record?)

However, at the end of his address, Borman again returned to the metaphor of the Earth, emphasizing it again over the promise of space. "…I would be a very shallow human being," he said, "if I did not confess to you that while I am deeply committed to our space exploration program, and to unlocking the secrets of the universe and of the moon, I am even more deeply committed to the future of this country and this earth."[199]

The spiritual legacy of the Apollo 8 mission would rest not in the book of Genesis, but instead in the photographs and impressions of the Earth brought back from the astronauts in their journey around the moon. Three days after the Apollo 8 capsule splashed down in the Pacific, NASA released a series of high quality color photographs taken by Hasselblad cameras on board. One series of images stood out from the rest – the eerie, spine-tingling images of a half-Earth hovering, dreamlike, over a grey and bombarded lunar landscape.[200] The reversal of the expected image – an Earth and sunlit moonscape as opposed to a moonlit landscape – gave the photograph a stunning otherworldliness. Now reproduced countless times, the image has become ubiquitous and perhaps unsurprising. Yet the image, taken at virtually the same point in the moon orbit as when the astronauts read the Genesis passages, revealed a darker, more disturbing, and perhaps psychologically abhorrent subtext.

According to one photographic analysis by geographer Denis Cosgrove, the photograph combined a living Earth, a "deathly lunar surface," and a sky free of stars. Cosgrove believes the photograph "suggests the complete isolation of terrestrial life in a black, sepulchral universe." The sense of the observer, that they are viewing the only living thing within what Buckminster Fuller called, "x-trillions of time years of nothingness," is that their vantage point is an utterly dead and void place. There is no air

[199] "Joint Meeting of the Two Houses of Congress to Receive the Apollo 8 Astronauts," p. 4.
[200] See Appendix B.

where the observer is situated. No life. Exposure to the moon's environment for even one second would utterly kill the observer.

With the release of the Earthrise photograph, and the vicarious experience of standing outside the living planet which it provided, the Buck Rogers utopian fantasies about large scale human habitation in space effectively died. The reality and totality of the moon's utterly barren, lifeless and killing surface made it an abhorrent place to imagine living.[201] The comments of Borman and Lovell on seeing the Earth from orbit confirm this visceral reaction to the view. For Borman, the moon was "a vast, lonely, forbidding type expanse of nothing" and "certainly… not…a very inviting place to live or work." The contrast between the Earth and the moon was undeniable and overwhelming. No amount of fantasy could turn that dead grey stone into a place where humans in any numbers would want to live. The moon, through Earthrise, became synonymous with death and the Earth became synonymous with life.

It was the disdainful comments of the astronauts in regard to the moon which would sum up the the most enduring impact of the moon missions on the perception of space travel in the years to come. The glorious space paintings of Chesley Bonestell, the triumphant moonbases of *2001,* the guarded yet slim expectation that some sort of life could be found on the moon – these visions of extraterrestrial hope were all dashed by the repulsive deadness of the seemingly post-apocalyptic moon and the absence of anything positive to say about it on the part of the astronauts. This visceral reaction to the moon's ashen and lifeless appearance – as if looking upon a corpse torn by violent bombardment – was strongly contrasted with the astronauts' bubbling joy over the beauty of the Earth. The words of the astronauts in trying to describe the simple and stark contrast between Earth and moon, blue and grey, life and death inherent in their simultaneous glimpse of

[201] See Appendix A.

both bodies – their words solidified the formation of a new spiritual symbol which would motivate and in the years to follow come to emblematize the environmental movement. The Earthrise photograph served as a sharp reproach to the extraterrestrial millennialist dreams of many in the space program. The moon was dead and would always be dead. Space became a graveyard, with the Earth the only flower.

With the aid of such a vision, some Americans began to reject the Protestant legacy of extraterrestrial technological transcendence and imminent apocalypse, and instead reimagine the Earth, sky and cosmos as immanent. Tied to this turn to immanence was a growing suspicion of motives of the American technocratic and military establishment. Despite the expressions of piety at the edge of infinity, more and more people began to believe that NASA, along with other American institutions, was becoming more and more like their counterparts in the Soviet Union – huge, bureaucratic, oppressive, and perhaps even dangerous. Once the Soviet Union and the United States became conflated in many people's minds, the space race theologizing began to seem rather infantile and pointless. The Apollo 8 mission effectively put an end to both the Space Age and the Cold War theological propaganda battle which accompanied it.

The Space Age in America began with theological confusion over the implications of spaceflight on Biblical language and cosmology. It ended with a new vision of the Earth that challenged not only traditional Christianity but the worth of the spaceflight endeavor itself. The most enduring spiritual legacy of the Space Age would involve not a resacralization of outer space into a new and modern heaven, but the rediscovery of an ancient human connection with the Earth. In the waning years of the Space Age emerged a more enduring Earth Age. In this new age, traditional Christianity, exo-millennialism, and a growing American environmental consciousness turned towards

the Earth – and not a reimagined heaven in outer space – for clues to the destiny of humanity and the planet.

## 5: Saving the Doomed Earth

Both the rhetoric of exo-millennialism and the Earthbound rhetoric of the conservation and environmental movements evolved in tandem. Jules Verne's *From the Earth to the Moon*, so central in the imagination of the rocketeers, was published only one year before George Perkins Marsh's groundbreaking book on the "modification of the Earth by human action," *Man and Nature.* In the same era the Earth began to be imagined as attacked by humanity, the Earth began to be imagined as being departed by humanity. From these two seeds sprouted ideas which would shape the future destiny of humanity: the colonization of space and the renewal of the Earth. Both movements were the result of reactions to a growing mechanization of the terrestrial sphere. And both movements searched desperately for an Eden no longer available on a fully surveyed Earth.

The nineteenth century Vermont naturalist, George Perkins Marsh, is credited with initiating the American conservation movement with his book *Man and Nature: The Earth as Modified by Human Action* (1864). Born in Woodstock, Vermont in 1801, Marsh grew up in an era when the ecological havoc wrought by an ignorance of sustainable agriculture and land use was evident throughout his rural state. Marsh's book took as its subject the Earth itself and saw the actions of humanity upon the Earth as harmful not only to the sustenance of nature but to the survival of humanity itself. Marsh also recognized that the environmental changes brought on by an inattention to the health of the land could induce permanent ecological damage, an observation he deduced by witnessing the denuded countryside around Rome. Marsh envisioned a time when the

United States would have as few forests and as few healthy rivers and streams as those surrounding the collapsed Roman empire. Marsh compared the environment of the Old World to the cold, dead land of the lunar surface, presaging environmental criticism of spaceflight by a century. "There are parts of Asia Minor, of Northern Africa, of Greece and even of Alpine Europe," he wrote, "where the operation of causes set in action by man has brought the face of the earth to a desolation almost as complete as that of the moon…."[202] Marsh made a bold prediction later echoed by environmentalists during the waning Space Age. "The earth is fast becoming an unfit home for its noblest inhabitant,

> and another era of equal human crime and human improvidence, and of like duration with that through which traces of that crime and that improvidence extend, would reduce it to such a condition of impoverished productiveness, of shattered surface, of climatic excess, as to threaten the deprivation, barbarism, and perhaps even extinction of the species.[203]

Henry David Thoreau championed the cause of the Earth during the same era. Thoreau did not live in the age of flight, or spaceflight, although in his journal he expressed dread for the day when such technologies would become possible. Writing about the rapid destruction of the northern forests, he expressed appreciation to the Creator for the contemporary restrictions on man's exploitative abilities. "Thank God," he prayed, "men cannot as yet fly, and lay waste the sky as well as the earth!"[204] More common than such predictive lamentations was Thoreau's identification of a cosmic and terrestrial relevance to the surface of the waters he dwelled beside. In *Walden*, Thoreau, looking out at the azure blue of Walden Pond on a late summer day, the waters reflecting the sky above, mused that "[a] lake is the landscape's most beautiful and expressive feature. It is earth's eye…" Thoreau imagined that in looking into this eye of the earth the

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[202] George Perkins Marsh, *Man and Nature; or, Physical Geography as Modified by Human Action.* David Lowenthal, ed. Cambridge, Massachusetts: Belknap Press of Harvard University Press, 1965. (1864) p. 42.
[203] Ibid, p. 43.
[204] Henry David Thoreau. *The Writings of Henry David Thoreau*. Bradford Torrey, ed. V. 14. 1906.

"beholder measures the depth of his own nature." Walden and White Pond were "great crystals on the surface of the earth"; Walden Pond was, in September or October, "a perfect forest mirror, set round with stones as precious to my eye as if fewer or rarer." "Nothing so fair, so pure," Thoreau felt, "and at the same time so large, as a lake… lies on the surface of the earth. Sky water. It needs no fence." Thoreau, living alone and according to the rhythms of the forest and pond, lamented the ignorance of nature which he found common amongst his kinsfolk. "Nature has no human inhabitant who appreciates her," he wrote "[W]hat youth or maiden conspires with the wild luxuriant beauty of Nature?" " For Thoreau, town life knew not of the Eden to be found just outside the gate. Nature "flourishes most alone, far from the towns where they reside," he wrote. "Talk of heaven! ye disgrace earth."

While Marsh and Thoreau championed the Earth in their writings, they did not see in the industrialism they dreaded the imprint of a quasi-Christian techno-ideology. As industry continued to explode into the wilderness Earth in the twentieth century, the disgust with the language of Earth disdain grew increasingly strident and incisive. Decades before the environmental movement raised the symbol of the Earth to the status of a holy icon, Cornell University agricultural professor Liberty Hyde Bailey penned a forceful indictment of the language of Earth disdain in a slim treatise entitled *The Holy Earth* (1915). Well-known as the author of practical texts on horticulture and agriculture, Bailey set out with a much different goal in *The Holy Earth*. In the book, Bailey turned traditional Christian cosmography on its head, questioning the basic assumption of a debased and depraved Earth which pervaded the sermons of American preachers and pervaded the Bible itself. Bailey's analysis was simple, direct, and irrefutable. While the Earth, to Bailey was "the scene of our life, and probably the very source of it," the

Christian heaven was "the source only of death…" Bailey noted that heaven was "peopled… with the dead" and that humanity had "built our philosophy on the dead."[205]

As Bailey summed up in one simple and powerful phrase, "the Earth is good." He recognized that Western culture and Christianity had for too long accepted as literal truth the notion of an evil and imprisoning planet. Man, felt Bailey, "has no right to assume a bad or evil earth, although it is difficult to cast off the hindrance of centuries of teaching." The centuries of teaching – the instruction to Christians and Europeans to think of the Earth as a temporary and depraved abode or a dark antechamber to heaven perched upon the edge of the abyss – were, Bailey claimed, in themselves wrong and even sinful. Bailey adopted a strident and angry tone: "It is a blasphemous practice that speaks of the hostility of the earth…"[206]

While the Earth in the modern age might no longer be imagined as possessed by a personified evil, Bailey recognized that the notion of an evil Earth had survived and was thriving and that the notion that the Earth was a sort of fearsome Hell was widespread and deeply entrenched. "The old fear of nature," he wrote, "that peopled the earth and sky with imps and demons, and that gave a future state to Satan, yet possesses the minds of men…"[207] This ancient view of the Earth was born, according to Bailey, of escapism and desperation – reactions to nature indicative of an as yet underdeveloped and immature humanity. Humanity had not yet awakened to the realization which possessed Bailey, that the Earth was a good and holy place. "Not being yet prepared to understand the condition of nature," Bailey wrote, "man considered the earth to be inhospitable, and he looked to the supernatural for relief; and relief was heaven. Our pictures of heaven are of the

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[205] Liberty Hyde Bailey. *The Holy Earth: A Machine-Readable Transcription*. "The Evolution of the Conservation Movement, 1850-1920," *American Memory: Historical Collections for the Digital National Library, Library of Congress Website*. http://lcweb2.loc.gov/ammem/amhome.html. First published by Scribner's in 1915.
[206] Ibid.
[207] Ibid.

opposites of daily experience – of release, or peace, of joy uninterrupted. The hunting-grounds are happy and the satisfaction has no end."[208]

But questioning traditional Christian cosmography and differential judgment did not necessarily mean that heaven need be rejected. Instead, claimed Bailey, a new vision of heaven could emerge from a reconnection of mankind to the Earth. "Heaven is to be a real consequence of life on earth," he wrote, "and we do not lessen the hope of heaven by increasing our affection for the earth, but rather do we strengthen it."[209] A fantasied deliverance into a distant heaven was escapist and myopic, thought Bailey. Heaven was here, already, on Earth. The Earth was Eden.

To counter this tendency towards disembodiment, Bailey sensed the rise of some great new thought, some rediscovery of a pure and heavenly joy of living life on a "good" earth – perhaps a reinterpretation of Christianity, and an abandonment of the value-laden cosmography which possessed men's minds. For Bailey, the anticipation of deliverance into the sky – the anticipation of transcendence – was the key psychological barrier which had to be overcome if the Earth was to be enjoyed and used correctly for future generations. Instead of the transcendent God of heaven, Bailey hoped for a broader recognition of an immanent God of Earth: "Waiting for this rescue," he wrote "we have overlooked the essential goodness and quickness of the earth and the immanence of God." Bailey hoped that a recognition of the immanent Earth could be the dawn of a new consciousness: "We begin to foresee," he wrote, "the vast religion of a better social order."[210] For Bailey, reconnection to the planet would come through a new spiritual orientation, one not extraterrestrial, but terrestrial.

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[208] Ibid.
[209] Ibid.
[210] Ibid.

> Verily, then, the earth is divine, because man did not make it. We are here, part in the creation. We cannot escape. We are under obligation to take part and to do our best, living with each other and with all the creatures… We are to consider [the earth] religiously: Put off the shoes from off thy feet, for the place whereon thou standest is holy ground.[211]

Bailey summed up an increasingly persuasive perspective in the United States – that the rapid industrialization of the previous century was, far from improving humanity's lot, was threatening the existence of the Earth itself, and that a renewed connection of humanity, and especially of Americans, to the Earth was necessary to prevent the further decline of nature. Writing in the age before rockets, before atomic bombs, Bailey sensed a pervasive hatred in Western culture and Christianity directed towards the planet itself. Perhaps Bailey, writing soon after the Wright Brothers opened the skies to man, sensed the beginnings of the "winged gospel," the valorization of the airman and the airplane which came to dominate American civic thought of his era.[212] He certainly sensed an otherworldly, disembodied will towards Earthly abandonment, embedded in Christian prejudices. At the same time, he looked forward to the emergence of a new – or resurrected ancient – thought in Western culture: that the Earth was divine.

Bailey's book found great favor with liberal Protestant denominations in the 1930s and 1940s, and his prose was prominently featured as part of the Federal Council of Churches' programs for "Rural Life Sunday," a mid-twentieth century attempt to institute a holy day devoted to farming, nature, and the Earth.[213] Part of that legion of conservationists birthed from Theodore Roosevelt's initiatives, Bailey sought, like Henry David Thoreau and John Muir before him, to evoke the wonder and beauty of nature. But Bailey's observation that the Earth and the natural world was suffering under an ancient

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[211] Ibid.

[212] See Joseph Corn, *The Winged Gospel: America's Romance with Aviation, 1900-1950*New York: Oxford University Press, 1983.

[213] Leigh Eric Schmidt. "From Arbor Day to the Environmental Sabbath: Nature, Liturgy, and American Protestantism," in *Harvard Theological Review*. 84:3 (1991). p. 312.

and unfair religious curse was an extension of the elevation of the earth motif in the writings of Thoreau and Muir.

The same apocalypticism which motivated the rocketeers to seek ascension to the stars began to appear in the literature of the environment and the Earth which appeared in droves on shelves in libraries and bookshops across the United States in the 1960s. Just as the Earth became a powerful metaphor at the same time that mankind was first entering space, a powerful "eco-millennialism" appeared, as if to counter the technological and extraterrestrial millennialism of the Space Age. Just as exo-millennialism was prone to exaggeration, hyperbole, and anxiety, the literature of ecological millennialism was guilty of the same sins. Many of the dire prophecies of 1960s writers such as Rachel Carson, Paul Ehrlich, and David Brower have not come to pass – prophecies of a collapsed civilization and an utterly despoiled and ruined Earth. Yet they warned of dire consequences only in their effort to wake up humanity to the dangers of a blind faith in the millennial promise of technology. In their effort to slow the seemingly inexorable rush of technology towards a point of no return, and in their effort to point out the potentially Earth-destroying effects of a perceived mad mechanical beast driven by humanity's greed, these authors employed the apocalyptic motif in opposition to a techno-apocalypse they envisioned already in motion and perhaps on the verge of a nuclear, chemical, and biological victory. And they did not see more technology as the necessary "fix" to the problems they deemed technology created. As cultural historians M. Jimmie Killingsworth and Jacqueline S. Palmer have pointed out, this eco-millennialism was an attempt not to undermine all of human progress, but instead to "transform the consciousness that a problem exists into acceptance of action toward a solution." By using the apocalyptic narrative in a political manner, these writers

prefaced "the solution with a future scenario of what could happen if action is not taken, if the problem goes untreated."[214]

During the Space Age, the conservation movement came into possession of a natural symbol and rhetorical device in the newly risen image and metaphor of the Earth. Even as the rockets promised transcendence and escape from a nuclear mad world, the Earth began to promise a radical alternative: a whispering and quieting counterbalance to the angry and anxious wish to be free of an imperfect existence on a depraved planet and perhaps a rejection of transcendence and escape, and an acceptance of immanence and settlement. The onset of the Space Age only strengthened the power of the Earth symbol in the creation of a stark contrast between the lifelessness of outer space and the abundance of life on Earth. In this section we will look at the some of the most prominent Cassandras of the 1960s Space Age Earth, in an effort to understand how the tide of the era began to turn – not away from the stars, or away from space, but away from a mechanical future, and towards an organic and sustainable cosmos.

## THIS IS THE AMERICAN EARTH

In 1960, the Sierra Club published what Executive Director David Brower called "by far the most important work the club has published" a large format coffee-table volume of photography entitled *This is the American Earth*.[215] Designed by Nancy Newhall and David Brower, with over half of the stunning black and white photographs taken by Ansel Adams, *This is the American Earth* was a moving, occasionally shrill, environmental jeremiad on the depredations against nature committed by modern man.

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[214] M. Jimmie Killingsworth and Jacqueline S. Palmer. "Millennial Ecology: The Apocalyptic Narrative from *Silent Spring* to *Global Warming*," in *Green Culture: Environmental Rhetoric in Contemporary America*. Carl G. Herndl and Stuart C. Brown, eds. Madison: University of Wisconsin Press, 1996. p. 22.
[215] Ansel Adams and Nancy Newhall. *This is the American Earth*. San Francisco: Sierra Club, 1960. p.1

No mere collection of nature photography – although it included plenty of unforgettable images of mountains, oceans, and other natural wonders – *This is the American Earth* also included images of starving third world children, visions of vast and unfettered urban sprawl, and unflattering vistas of technological decay. In the title, Newhall, Adams, and Brower conveyed a tri-partite meaning: the "American Earth" they show in Adams' photographs and Newhall's prose is both the beautiful Earth of the montane west and the poisoned Earth of an industrialized America; at the same time, the title conveys the sense that the Earth, the whole world, is now controlled by the American forces which simultaneously love and destroy the beauty of nature. The contrast between nature pristine and nature destroyed was a powerful one. The text, a long poem by Newhall, alternated between soft evocations of the Earth's natural wonder, and blistering critiques of technology, industry, and American Space Age man.

"Out of the vast depth of time past / Man comes like a meteor's flash," began the text, next to a full page image of the Spiral Nebula taken by a telescope at California's Palomar Observatory. The first line evoked both humanity's brief history and the flight of Sputnik three years earlier. Newhall interlaced images of natural harmony with dark visions of technological depravity. Written after Sputnik but before the launch of any humans into space, the book referred on numerous occasions to the nascent space race – even in its very choice of title -- and became one of the first widely disseminated pieces of environmentalist literature to use the Earth motif to critique mankind's movement off of the planet. The text's pleas on behalf of a neglected Earth were with the recognition that a substantial and increasing segment of the population believed that departure from the Earth was an inevitable development. At the same time, Newhall's text turned the Christian hierarchy on its head, by denying that heaven could be found in space and instead locating the ethereal Eden on Earth. By characterizing technology as rooted in

alchemy and Satanism, and by characterizing the space exodus as a futile attempt to locate Eden, Newhall intimated that human blindness to the long-term effects of rampant industrialism would be the most likely initator of the apocalypse of the Bible.

After asking the reader to meditate on the billions of years since the Earth's creation, Newhall cryptically asked, also in a seeming evocation of Sputnik, "We remember dragons. / What were we when we saw a phoenix hatch in flame, a serpent fly bright-winged across the sun?" The book consistently characterized technological development as wondrous, but in some deep and sinister manner, satanic. Spaceflight was characterized as one of the ultimate expressions of technological evil. "Was it five hundred years ago that Man's strange genius, desperate, / dreaming of new means to live, turned to try /

> -- to harness the invisible, the intangible, the forces known by Satan,
> prince of the powers of the air
> -- to delve deep down for fuels, ores, metals, unknown except to alchemy
> -- to sail, to search for wealth beyond all known horizons on this sphere
> to fly, to catch the lightning in his hand?
> to conceive a universe no longer centered upon Man, Earth, nor this
> near star, the Sun?

Further on, on a page which juxtaposed another nebula – the Crab Nebula – with the book's most searing language, Newhall asked the reader "to what shabby hells of our own making do we rush? A poisoned, glutted planet, rolling through dark noxious air?" These "shabby hells" of the "glutted planet" she imagined might be the continents, "webbed, crawling, flitting with a feeble race, / misshaped, febrile, moved by machines, push-buttoned to thought, / kept miserably, endlessly, half-alive by surgery, injections, rays?" and whose race are those that "never knew delight, nor freedom, nor walked to think alone?" Newhall then asked if this "feeble race" was

> launching with its last energy its doomed and wretched seed,

exiles without hope of return, forth into outer space –
to seek at frightful speed, for years, lifetimes, aeons, perhaps in vain,
for other worlds, new Edens, again to conquer, ruin, and corrupt?

One page placed one of the longest passages in the book next to a striking and atypically bleak photograph by Ansel Adams of a wiry and twisted television antenna set against a star black sky, with a half-moon hovering off to the left. Here, Newhall crafted a depressing and dystopian vision of mankind's attempted conquest of earth and space:

Now, by machines, we are torn loose from the earth –
too soon, too suddenly surrendered, the arts, skills, strengths
that were our pride as Man.
Confined by our own artifice, borne up on vast abundance and colossal waste,
Restless, disconsolate, passing in higher, faster flight
over old arduous obstacles,
above old bitter boundaries,
we course across this dwindling globe that once seemed infinite,
hoping to find some shell of civilization harboring still
the echoes of old faiths, passions, and delights;
we descend into the seas, scale the last dread peaks, cross icecaps, dare outer space,
seeking somewhere, in some last far place, our birthright; the wild majesty, beauty, freedom through which for a million years Man grew,
-- too few of us aware that to any beauty we must come as lovers, not destroyers,
come humbly, softly, to look, listen, learn,
to cherish and to shield.

The book concluded with a small and quiet siren call from Mother Earth, but one with crushing implications for the spacebound dream if heeded: "Tenderly now / let all men / turn to the earth."

*This is the American Earth* gave a taste of the acrimony which characterized the ensuing decade. This barely concealed rage at the Space Age, and the recognition that in the departure from the planet of the spacebound on the backs of rockets, a humanity not wishing to go would be left behind on a charred cinder, evoked a sense of not only great anger, but one of betrayal and loss. In stressing the violence of the machine, *This is the American Earth* posited a tender, neglected, soft, and nurturing Earth, and contrasted this

with a violent, fiery, devilish, and unforgiving technology. In lashing out at the nascent space race, and the age it engendered, Newhall, Adams, and Brower launched one of the first battles in a war of rhetoric over the future of the new, post-WWII, assumed to soon-be-abandoned Earth.

## THE DYING EARTH

As Sputnik flew, and satellites proliferated, and then as the Kennedy moon challenge seemed to implant the imprimatur of inevitability of imminent space colonization into the American mind, the Earth ceased to be thought of any longer as the "ground" or "soil." The Earth became an entity or a system of which humanity was recognized as the controlling interest. Through the actions of humanity, the Earth could live or the Earth could die. The Earth could be left behind. For those that found in the perceived destruction of the human environment a sign of a mounting apocalypse, the stakes of the 1960s rose immeasurably. This shift awakened many to the uncomfortable realization that if they were not going to fight for the survival of the planet then they were essentially becoming complicit in a collective form of planetary suicide. The situation suddenly seemed that dire. The poignant musings of poet-naturalists were replaced by the sharp-edged and apocalyptic warnings of scientists and political essayists.

In 1962, biologist Rachel Carson dedicated her expose of the chemical industry, *Silent Spring*, to humanitarian and naturalist Albert Schweitzer. She placed on the otherwise blank dedication page Schweitzer's ominous and apocalyptic prediction: "Man has lost the capacity to foresee and forestall. He will end by destroying the earth." His words, spoken at the dawn of the Nuclear Age, took on greater resonance during the triumphs of the Space Age. If man would succeed in destroying the earth, then the spaceflight triumphs of 1962 certainly placed him in the commanding and distant location

from which to deliver the crushing blow. On the next page, Carson posted a quotation of E.B. White's:

> I am pessimistic about the human race because it is too ingenious for its own good. Our approach to nature is to beat it into submission. We would stand a better chance of survival if we accommodated ourselves to this planet and viewed it appreciatively instead of skeptically and dictatorially.

When Carson required inspirational or dire language throughout *Silent Spring*, she used the image of the Earth. "As man proceeds toward his announced goal of the conquest of nature," she opened her chapter "Needless Havoc," "he has written a depressing record of destruction, directed not only against the earth he inhabits but against the life that shares it with him." She paraphrased Robert Frost at the start of another chapter: "We stand now where two roads diverge… The other fork of the road – the one 'less traveled by' – offers our last, our only chance to reach a destination that assures the preservation of the earth." And in conclusion she characterized modern applied science and its fantasized "control of nature" as a "phrase conceived in arrogance, born of the Neanderthal age of biology and philosophy…

> It is our alarming misfortune that so primitive a science has armed itself with the most modern and terrible weapons, and that in turning them against the insects it has also turned them against the earth.[216]

Carson used the terms "earth," "life," and "nature," in much the same quasi-mystical way as Schweitzer and Bailey and to similar inspirational effect. *Silent Spring* resonated with readers of the early 60s because its imagery of a planet threatened by an unchecked and unregulated science and technology became all the more immediate in the Space Age. For Carson, the Earth was the innocent civilian in a technological war of uncontrolled insanity.

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[216] Rachel Carson. *Silent Spring*. Boston: Houghton Mifflin, 1962.

The threatened Earth that naturalists and environmentalists like Schweitzer, Carson, Loren Eiseley, Aldo Leopold, and Barry Commoner described in their writings of the 1960s was a planet under attack by the power-mad forces of science and technology. In *Silent Spring*, Carson described the attempts of Long Island residents to prevent crop-dusters from spraying their homes, gardens, and farms with DDT, her chapter entitled, ominously, "Indiscriminately From the Skies." The theme of the era, repeated consistently in the writings of nascent environmental movement, was that the Earth itself was in the process of being destroyed and poisoned from above.

In a book published the same year, U.S. Secretary of the Interior Stewart L. Udall warned the American public of a "quiet crisis" gripping the Earth. Udall painted a picture of twentieth century man as misdirected and out of touch with the natural world. "America stands poised today on a pinnacle of wealth and power," Udall wrote. "Yet we live in a land of vanishing beauty, of increasing ugliness, of shrinking open space, and of an overall environment that is diminished daily by pollution and noise and blight." Like Notre Dame's Hesburgh, Udall lamented the lopsidedness of American priorities:

> Our successes in space and our triumphs of technology hold a hidden danger: as modern man increasingly arrogates to himself dominion over the physical environment, there is the risk that his false pride will cause him to take the resources of the earth for granted – and to lose all reverence for the land.[217]

Like Carson, Udall characterized the earth as a neglected and abused entity left behind in mankind's technological march of progress. The space program, for Udall, represented the ultimate technological endeavor – an endeavor which he felt was diverting resources and perhaps more importantly, the attention of the human spirit from the legion of problems on earth.

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[217] Stewart L. Udall. *The Quiet Crisis*. Holt Rinehart & Winston: New York, 1963. pp. vii-viii.

Carson and Udall's books each represented a different approach to the environment, but the two approaches gradually coalesced into a common movement. Whereas Udall lamented the loss of wilderness and open space and the ugliness of the urban environment, the biologist Carson warned about the rapid poisoning of global survival systems via chemical and industrial pollution. Both Carson and Udall shared common goals and wrote passionately in a common tongue; yet they saw depredations on the earth from the alternating perspectives of the scientist and the layman, the naturalist and the politician, the woman Eastern urbanite and the male Western rancher.

As the politics of the decade became more acrimonius, so too did the stridency of the cries of the Earthbound. Carson's dire warnings about the build-up of chemicals in the global environment was an example of the eco-reactionary apocalyptic, but few environmental treatises could compete in outright apocalypticism with Paul Ehrlich's 1968 *The Population Bomb*.

## THE POPULATION BOMB

By 1968, the conservation arm of the coalescing environmental movement was appeased by a string of wilderness and National Park designations by Presidents Kennedy and Johnson, but as yet no political inroads had been made against industrial pollution and a host of other environmental concerns. No book with the global environmental impact of Rachel Carson's *Silent Spring* had been published in the interim, although works on the subject were steadily multiplying. It would take another biologist-penned jeremiad, Stanford University professor Paul Ehrlich's *The Population Bomb*, to re-invigorate the debate and to again draw the attention of the public to global environmental issues and the symbol of the Earth.

Ehrlich's book became an instant classic. Its covers festooned with dire and depressing factoids ("While you are reading these words four people will have died from starvation. Most of them children.") and apocalyptic rhetorical questions ("Population control or race to oblivion?"), *The Population Bomb* combined the warnings of *Silent Spring* with the marketing style of a tabloid newspaper. Ehrlich's prologue set the tone: "The battle to feed humanity is over," he wrote. "In the 1970's, the world will undergo famines – hundreds of millions of people are going to starve to death in spite of any crash programs embarked on now." Using food production statistics from the 1960s Ehrlich came to the conclusion that global famines of apocalyptic proportions were going to sweep the developed and underdeveloped world in the next decade. Ehrlich also expanded on Carson's critique of the pesticide and chemical industries, and wrote the first widely read discussion of global warming and the "greenhouse effect." For Ehrlich, the population problem underscored the global nature of environmental threats.

Due to Ehrlich's extreme pessimism, *The Population Bomb* touched a nerve in the American body politic. His dire warnings, marked with the imprimatur of rationality provided by his Stanford professorship, scared Americans green in much the same way that Von Braun's predictions of extraterrestrial Soviet nuclear bases helped to scare Americans into space. Ehrlich's writings often read like a post-apocalyptic science fiction novel as he used the voice of a potential future narrator commenting on the collapse of civilization in the 1970s. Rachel Carson's warnings about DDT were dire enough but Ehrlich moved up the timeline, prophesying in one 1969 article that 1979 would see "the end of the ocean" as a result of DDT interference with algae photosynthesis, that 1972 would see New York and Los Angeles "smog disasters" which would create "200,000 corpses," and that in 1973, a scientific report would come out which would predict that the accumulation of DDT in the livers of those born since 1946

meant that the average life expectancy of all baby boomers would plummet to 49 years. Ehrlich couched his "predictions" in hypothetical retrospectives but the effect of his warnings was strong. Humanity was in its last generation, claimed Ehrlich, and there was nothing to be done except the dismantlement or severe curtailment of industrial civilization.[218]

Ehrlich saved his most dire predictions, however, for the threats posed by overpopulation. "Most of the people who are going to die in the greatest cataclysm in the history of man," he claimed in 1969, "have already been born."[219] Unlike the rocketeers and evangelicals, Ehrlich saw no ascension of the chosen in sight. In his whole Earth analysis of the growing threat posed by overpopulation Ehrlich specifically dismissed any speculation that space exploration and colonization could ameliorate the coming catastrophe. "Skip for a moment the virtual certainty that those planets are uninhabitable. Forget also the insurmountable logistic problems of moving billions of people off the Earth," he wrote. "[A]t the current growth rate, in a few thousand years everything in the visible universe would be converted into people, and the ball of people would be expanding at the speed of light!"[220]

Several years later, Gerard O'Neill used Ehrlich's figures and pessimism to advocate for just this outcome – the abandonment of Earth and the colonization of space. In turn, Ehrlich became one of the few environmentalists to endorse O'Neill's plan. Their common apocalypticism retained similar fearmongering motives. Like the fire and brimstone preachers of the evangelical movement, they tried to scare the American populace into compliance with their draconian plans. Ehrlich's shrill and inaccurate

[218] Paul R. Ehrlich. "Eco-Catastrophe!" in *Ramparts*. September, 1969.
[219] Paul R. Ehrlich. "Eco-Catastrophe!" in *Ramparts*. September, 1969.
[220] Paul Ehrlich. *The Population Bomb*. New York: Sierra Club-Ballantine, 1968 (1970). Pp. 20-21.

predictions paralleled the inaccuracies of space enthusiasts who predicted that children would be born on the moon before 2000.

At the same time that Ehrlich predicted the imminent collapse of civilization, others began to recognize that the ancient Christian disdain for the Earth could lie at the root of global environmental decay. In December of 1966 medieval historian Lynn White delivered an address to the American Association for the Advancement of Science. Entitled "The Historical Roots of Our Ecologic Crisis," and subsequently published in the journal *Science*, White's paper created a firestorm of controversy. White blamed the planet's ecological ills on Western Christianity. "One thing is so certain that it seems stupid to verbalize it:" he wrote. "both modern technology and modern science are distinctively *Occidental*.

> Our technology has absorbed elements from all over the world, notably from China; yet everywhere today, whether in Japan or in Nigeria, successful technology is Western… Today, around the globe, all significant science is Western in style and method, whatever the pigmentation or language of the scientists.

White believed that Western science and technology inherited their perspective on the Earth from Christianity, which he called "the most anthropocentric religion the world has seen." White maintained that Western Christian thinkers, since the medieval era, had abandoned a moral stance toward the natural world which had been dominant in an earlier pagan Europe. Whereas in animistic pagan cultures in pre-Christian Europe and elsewhere, every tree, animal, and mountain was the home of a particular spirit, Christianity denied animism. Instead, the cult of saints had replaced a belief in nature spirits. As White pointed out, this substitution involved a symbolic dismissal of the Earth and nature in the process: "The saint is not *in* natural objects," he wrote. "He may have special shrines, but his citizenship is in heaven." Nature and its constituent elements under Christianity, White maintained, became so objectified as to lose their intrinsic

value. With the attention of Christians oriented towards the saints above, the constituents of Earthly nature became debased and inconsequential. Of the early saints, White found only Saint Francis of Assisi to possess a form of Christian faith worthy of being called ecologically informed.

White's strongest statement identified the problem with the destructive power of modern technology as inherent in its Christian backdrop and its attitude toward the Earth. The growth of technology, White maintained, could not be understood "apart from distinctive attitudes towards nature which are deeply grounded in Christian dogma." In the absence of a new value system the ecological crisis would worsen and that only by rejecting the "Christian axiom that nature has no reason for existence save to serve man" could disasted be averted.[221]

White's thesis remains a subject of debate nearly 40 years later. He advocated for the same reorientation of Christianity which Bailey advocated fifty years earlier. Whereas Bailey thought that Christians should begin to envision the Earth as the here-and-now heaven, White saw in the example of St. Francis the new hero for a new ecological era. However, the arguments of both Bailey and White were small voices protesting against a massive hierarchical spiritual consciousness involving the central drama of Christianity: the ascension of Christ and the duty of Christians to emulate his example. The language and hierarchical cognition of Christianity was too strong to be intellectualized away, in however compelling a fashion.

It would take an encounter with the Earth from afar to fully challenge the perspective Marsh, Thoreau, Bailey, Carson, Ehrlich and White warned was detrimental to human survival. The photographs of Earth from space accomplished more in their

[221] Lynn White. *Dynamo and Virgin Reconsidered: Essays in the Dynamism of Western Culture*. Cambridge, MA: MIT Press, 1968.

mind-bending inversion and implications than any intellectual or poetic argument ever could. By seeing the totality of human existence from a great distance and in realizing that the flight off of the planet was not a flight into eternal life and heaven, but instead a flight into a cold region of suffocation and death, many began to question the legitimacy of Christian hierarchy upon which the exo-millennialism of the space program rested.

**LOST MOON, FOUND EARTH**

In 1968, Stanley Kubrick's film adaptation of Arthur C. Clarke's short story, "The Sentinel," was released as *2001: A Space Odyssey*. The movie became an instant hit with not only science fiction fans, but with the disaffected “countercultural” youth of the era. One of the founding members of the British Interplanetary Society, Clarke has advocated for the colonization of space for his entire life. A self-professed atheist, Clarke became the twentieth century's most fervent promoter and explicator of a strictly secular version of extraterrestrial millennialism. His writings repeatedly invoke the two key facets of the spaceflight apocalyptic – a disdain for a doomed and insignificant Earth, and a glorification of the rapturous escape of humanity into the heavens. Clarke's atheistic exo-millennialism derived from the tradition of J.D. Bernal.

Clarke’s earliest writings revealed a sense of disgust with the Earth, likening the planet to a cosmic cesspool. “Looking out across immensity to the great suns and circling planets, to worlds of infinite mystery and promise” he asked in a 1920s British Interplanetary Society leaflet, “can you believe that Man is to spend all his days cooped and crawling on the surface of this tiny Earth – this moist pebble with its clinging film of air?”[222] With the advent of the atomic bomb, Clarke saw the expansion of humanity into

[222]Quoted in William Sims Bainbridge,*The Spaceflight/Revolution: A Sociological Study*. Robert E. Krieger: Malabar, Florida, 1983. p. 150.

space as an inevitable imperative, necessary to escape a nuclear-threatened Earth. In 1951, Clarke connected the exploration of space with escape from the curse of the Manhattan Project. "We stand now at the turning point between two eras," Clarke wrote.

> Behind us is a past to which we can never return, even if we wish. Dividing us now from all the ages that have ever been is that moment when the heat of many suns burst from the night sky above the New Mexico desert – the same desert over which, a few years later, was to echo the thunder of the first rockets climbing toward space. The power that was released on that day can take us to the stars, or it can send us to join the great reptiles and nature's other unsuccessful experiments.[223]

But Clarke did not restrict his hope of space exploration to merely curing nuclear neuroses. Instead, he looked to it to completely transform the planet, making the twentieth century merely a "prelude to some great drama." Landing on Mars and Venus, Clarke believed, would, from a future historian's point of view, end the "childhood of our race" and begin "history as we know it."[224] For Clarke there were two choices for the future: either our descendants will be "dispossessed savages clinging to the fertile oases in a radioactive wilderness" or they will be exploring the stars.[225] Clarke's novels often reveled in the abandonment, and in some cases, destruction of the planet. One of his early novels, *Childhood's End*, concluded with the quiet extinction of modern-day humanity through the 'benevolent' intercession of an extraterrestrial race of overlords, and the migration of a 'risen' humanity off of an exploding Earth.

Kubrick and Clarke's *2001* grossed over $56 million, making it the second most successful movie in 1968. With the Apollo astronauts set to land on the moon, *2001* seemed to many to be a sneak preview of humanity's imminent extraterrestrial future. But another wildly successful movie released that year delivered a decidedly different

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[223]Arthur C. Clarke. "Means and Ends in the Space Age," in *Speaking of Space: The Best of Space Digest*. Richard M. Skinner and Walter Leavitt, eds. Boston: Little Brown, 1962. p. 101.
[224]Clarke, "Means and Ends...,". p. 102.
[225]Ibid., pp. 100-101.

vision of space exploration. In *Planet of the Apes*, space exploration was portrayed as less the discovery of new worlds, than as nuclear weaponry's twin technology of doom. Clarke's vision of a choice between escape to the sky or destruction on Earth is no choice in *Planet of the Apes*: the Apocalypse is created by the technologies of man. In the film, four astronauts crash-land on a strange world governed by talking apes. Launched on an interstellar expedition in 1972, the crew placed in suspended animation, the astronauts emerge from their capsule with no idea what world they are on. Soon after landing, the astronauts encounter a band of straggly humans resembling Clarke's "dispossessed savages clinging to the fertile oases in a radioactive wilderness," but are swiftly taken captive by a band of armed ape-men. Taylor, the astronaut played by Charlton Heston, is the only member of his crew to survive the encounter with his sanity and life intact. By the end of the film, it becomes clear that Taylor has returned to New York thousands of years in the future after the virtual extinction of humanity due to nuclear war.

The success of *Planet of the Apes* in 1968 revealed the public's familiarity and fascination with the possible dystopian flipside of manned spaceflight and represented the rapidly withering vision of space travel in the American mind. For all the triumphalist rhetoric about humanity's expansion into the universe, it was impossible to hide the fact that rocketry's destructive threat to the Earth was much more immediate than rocketry's promised deliverance of humanity into the sky. Philip K. Dick's 1968 sci-fi novella, *Do Androids Dream of Electric Sheep?*, later adapted into the 1982 film *Blade Runner*, painted a similarly pessimistic vision of the legacy of space exploration. Set in the Los Angeles of the twenty-first century, Dick's novella portrayed the Earth as ravaged after a nuclear war with most of its inhabitants obsessed with escaping the planet for supposedly idyllic and endlessly advertised space colonies. Dick's future Earth, through space expansion, became the cesspool of the universe. And space colonies, built by rebellious

androids who have now come to exact their revenge on their Earthbound progenitors, were the utopian dream to which humanity clung.

Perhaps the most overtly apocalyptic film of 1968, George Romero's cult classic *Night of the Living Dead*, imagined the chilling resurrection of the Earth's deceased into cannibalistic zombies – a contemporary realization of the Biblical prophecy that at the coming of the Apocalypse, the dead will rise out of their graves and walk the Earth. But the resurrection of the dead in Romero's film is not occasioned by the coming of Christ, but instead by the unleashing of radioactivity by the crash of a space probe returning from Venus. The rapture of spaceflight, in *Night of the Living Dead*, brings not abundance and freedom from want, but instead the horrific nightmare of a post-apocalyptic world in which hungry and mindless corpses seek out the living for food.

Would space exploration bring the blossoming of the fruit of a tiny Earth, or would it result in meaningless destruction from above? The space cinema and literature of 1968 -- *2001*, *Planet of the Apes*, *Do Androids Dream of Electric Sheep* and *Night of the Living Dead* -- revealed the anxieties of a nation headed for an uncertain future in outer space and with little confidence that the outcome would be as gloriously transcendent as promised by the extraterrestrial millennialist worldview.

## IMAGINING AN UNSEEN EARTH

Prior to the Apollo missions, NASA officials and space experts were not even sure that the Earth would appear all that attractive from space. Space artists frequently envisioned a bland appearance to the planet, assuming that the whole Earth would appear similar to how her sister planets appeared through telescopes. Legendary British space artist Chesley Bonestell became famous in the mid-twentieth century for his "spacescapes," brilliant imaginations of what one might see from the perspective of being

on a distant planet. Bonestell's paintings had the effect of transporting the viewer to an alien world, perhaps devoid of life, upon which other planets, and the sun, appeared at a different scale. His most famous work, the 1949 book *The Conquest of Space*, co-authored with Willy Ley, showcased his mind-bending art and largely defined how an entire generation imagined how space would appear, and what space travel would be like.

In Bonestell's paintings for the book, the outer planets, especially Jupiter and Saturn, appear strikingly beautiful, a mélange of pastels, mysterious multicolored rings, and brilliantly colored landscapes. Venus, on the other hand, is rendered as a "featureless disk," and Ley, in the caption, remarks that "this condition will probably continue to prevail even for spaceships until the ship gets fairly close, unless it is equipped with very powerful optical instruments."[226] Bonestell perhaps imagined that Earth, like its sister planet Venus, would appear similarly featureless from far away. Only two of his many color plates in the book feature the Earth at all, and then, in both images, it is a small, vaguely blue-tinted orb suspended above a mountainous moonscape. Many of Bonestell's black and white plates feature the Earth, often as the dominant image, but in each case the planet is depicted as drab, shrouded in pale clouds, with little surface definition, and very little hint of color variation. In most images, it appears little different from Venus, which is depicted consistently as a featureless white orb.

Bonestell's inability to successfully predict how the Earth would look from space can in part be explained by the fact that while humans can use telescopes to look at other planets, no such ability existed prior to spaceflight to position those telescopes outside the Earth's atmosphere. This is clearly the primary reason for the failure of pre-Sputnik artists to imagine the appearance of the Earth. But one must also ask if such a failure of imagination can in part be attributed to a lack of imagination – even a lack of interest –

[226] Chesley Bonestell and Willy Ley. *The Conquest of Space*. New York: Viking, p. 123.

among rocketeers and the space advocacy community, in the potential beauties of the Earth. Great care was expended by Bonestell in bringing out every hue in the clouds of Jupiter, but little conjecture was put into imagining the appearance of the Earth. One might argue that Bonestell refused to conjecture too widely, lest he be proved wrong at a later date, but when one looks at his fantastic extraterrestrial spacescapes, the question of Bonestell's ability to conjecture becomes immaterial. The Earth, for the spacebound, was just not that interesting.

## RIDERS ON THE EARTH

Of all the artistic observations about Apollo 8's achievement, few received as much attention, or were reprinted as often as poet Archibald MacLeish's short "reflection," "Riders on the Earth," first published in the *New York Times* on the day after Christmas. MacLeish remained a popular poet throughout the twentieth century, his prolific outpout and publications surpassed only by Robert Frost. Throughout his life MacLeish sought a poetic voice and subject which could communicate his world-unifying philosophy founded on equal parts disillusionment with Communism, Fascism, and American capitalism. Macleish penned "Riders on the Earth" in this vein and it became his most popular and well-known work. In the piece, MacLeish gave voice to a dawning realization within American and world culture that the true legacy of the moon missions would not be a feverish colonization and lunar land rush, but instead a profound reimagination of the human relation to the home planet, and hopefully a reimagination of humanity's common heritage and brotherhood. MacLeish began his short piece by reminding readers of the inextricability of human cognition of the planet in relation to mankind's self-image. "Men's conception of themselves and of each other has always depended on their notion of the earth," MacLeish wrote. He then proceeded to contrast

the medieval conception of a fathomable geocentric cosmos with the modern scientific conception of a de-centered universe filled with an unimaginable array of suns and perhaps other earths.

"When the earth was the World – all the world there was – and the stars were lights, in Dante's heaven, and the ground beneath men's feet roofed Hell, they saw themselves as creatures at the center of the universe, the sole, particular concern of God – and from that high place they ruled and killed and conquered as they pleased," observed MacLeish. But the modern realization of Earth's inconsequential nature had not solved mankind's blood lust, MacLeish claimed. Instead, it had perhaps made it all the more justifiable.

> And when, centuries later, the earth was no longer the World but a small, wet, spinning planet in the solar system of a minor star off at the edge of an inconsiderable galaxy in the immeasurable distances of space – when Dante's heaven had disappeared and there was no Hell… men began to see themselves, not as God-directed actors at the center of a noble drama, but as helpless victims of a senseless farce where all the rest were helpless victims also, and millions could be killed in world-wide wars or in blasted cities or in concentration camps without a thought or reason by the reason… of force.

MacLeish identified the true legacy of the Apollo 8 mission as not the close-up glimpse of the moon, but instead the awesome backwards glance at a receding, common earth. "…[I]n the last few hours," MacLeish wrote, "the notion may have changed again.

> For the first time in all of time men have *seen* the earth: seen it not as continents or oceans from the little distance of a hundred miles or two or three, but seen it from the depths of space: seen it whole and round and beautiful and small as even Dante – that 'first imagination of Christendom' – had never dreamed of seeing it; as the Twentieth Century philosophers of absurdity and despair were incapable of guessing that it might be seen.

The Earth image, MacLeish claimed, only "hours" after the successful attainment of the moon by Lovell, Borman, and Anders, could be the key to soothing the dissonance created by Western man's pained search for his own purpose. While the medieval notion

had put man "at the center of everything," and the "nuclear notion," had put man "nowhere – beyond the range of reason even – lost in absurdity and war," MacLeish felt that the Earth, the "latest notion," could very well have "other consequences."

> Formed as it was in the minds of heroic voyagers who were also men, it may remake our image of mankind. No longer that preposterous figure at the center, no longer that degraded and degrading victim off at the margins of reality and blind with blood, man may at last become himself.

With this hope, MacLeish concluded his piece with a paragraph which at the time was taken as a comment on the then-raging conflict in Vietnam, and reprinted in newspapers all over the world. "To see the earth as it truly is," he concluded,

> …small and blue and beautiful in that eternal silence where it floats, is to see ourselves as riders on the earth together, brothers on that bright loveliness in the eternal cold – brothers who know now they are truly brothers.[227]

Several features of MacLeish's piece made it anachronistic almost as soon as it was written. The consistent use of the term "men" instead of "human" lent it an air of chauvinism; the Cold War and Vietnam War context in which it was written provided it with a sense of peace movement idealism without real substance; and lastly, the piece resurrected a largely dying fantasy that through the superpower race into the heavens could be crafted a common goal for all humanity and perhaps bring about the end to global conflict.

However, MacLeish's observations hit upon several key themes which resonated throughout future discussions of the importance of the space program, as well as future discussions of the meaning of the Earth photographs. For one, MacLeish's piece energized the quasi-utopian expectation that the Apollo photographs of the Earth would somehow alter human consciousness in such a profound manner as to forever change the

[227] Archibald MacLeish, "A Reflection: Riders on Earth Together, Brothers in Eternal Cold," in *New York Times*, December 26, 1968. p. 1.

course of human history. In 1948, British astronomer Fred Hoyle predicted that "[o]nce a photograph of the Earth, taken from the outside, is available, we shall, in an emotional sense, acquire an additional dimension." This additional dimension, Hoyle hinted, might provide mankind with a perspective on himself that could prove beneficial to his continued survival. “[O]nce let the shear isolation of the Earth become plain to every man whatever his nationality or creed,” he wrote, “and a new idea as powerful as any in history will be let loose."[228] What made Hoyle and MacLeish’s expectation about the Earth photography so novel and powerful was that their observations inverted the space program’s “outward” rhetoric – that space exploration in and of itself would unite the superpowers, and by extension, mankind – and created an “inward” rhetoric for which the space program was not politically or institutionally prepared. Neither NASA's leadership, nor its public relations office, was prepared for the photographs of Earth from outer space to be a lasting legacy of the program. Manned by thousands of technicians, divided roughly evenly between die-hard space enthusiasts and brilliant, but single-issue-oriented engineers, their mutual goal was the construction of a technocratic monolith capable of reaching the moon, the planets, and the stars. Leaving the Earth was their collective and consuming passion, no matter if they adhered to a fervent belief in exo-millennialism or not. NASA's plan and institutional charge called for common exploration of the unknown and the defeat of the Soviets, and only incidentally a common global vision of the Earth’s fragility and beauty.

## EARTH SHINE

Anne Morrow Lindbergh saw a similar lesson in the moon flight of Apollo 8. The wife of the pioneering aviator and a famous writer in her own right, Lindbergh penned an

[228]Fred Hoyle. *The Nature of the Universe*. New York: Harper, 1951.

essay, "Earth Shine," for *Life* magazine about her visit to Cape Kennedy prior to the launch. Both she and her husband were invited by NASA to witness the event, and to dine with the astronauts at their last meal before liftoff. Lindbergh himself had become a virtual saint in the early twentieth century messianic faith in aviation which historian Joseph Corn has dubbed the "winged gospel," and had been a sponsor of Robert Goddard and an enthusiastic supporter of aviation prior to the Second World War. But the events of the intervening half-century had changed Charles Lindbergh's perspective on technology and the environment. As early as 1948, Lindbergh had begun to write against the very proliferation of machines and high technology which he advocated just a few decades earlier. In his 1948 book *Of Flight and Life,* Lindbergh told his readers that he had an "overwhelming desire to communicate belief to others, to band together with one's fellow-men in support of a common cause." On two occasions prior, he had tried to communicate this vision. In his book *We,* Lindbergh had proclaimed that the United States should lead the world in the glorious development of flight, and had advocated the adoption of the "winged gospel." "I devoted my life to planes and engines, to surveying airlines, to preaching, wherever men would listen, the limitless future of the sky," he admitted in *Of Flight and Life*. On the second occasion he had tried to rally Americans to oppose the Second World War, believing it would sap the nation's energy in a war that would better be fought between the totalitarian nations of Germany and the Soviet Union. However, in *Of Flight and Life,* Lindbergh set out to warn readers of a far more menacing threat. "We are in the grip of a scientific materialism," he wrote, "caught in a vicious cycle where our security today seems to depend on regimentation and weapons which will ruin us tomorrow.

> I believe the values we are creating and the standards we are now following will lead to the end of our civilization, and that if we do not control our science by a higher moral force, it will destroy us with its materialistic values, its rocket

> aircraft, and its atom bombs – as its has already destroyed large parts of Europe.[229]

Lindbergh recognized earlier than most that the rocket and the atomic bomb were created as part of the same all-devouring will towards utter destruction of the planet. After the war, the aviator turned away from technology and toward the Earth, a reformation in thought spurred by his wife, Anne. Science, Lindbergh believed, was upsetting the balance of western civilization, not maintaining it. The bombs of modern science were "only a wartime manifestation of the materialism with which it attacks all life. We are becoming the slaves of science, slaves of its war-machines, its mines, its factories, its offices and balance-sheets, its bureaucracy and regulations.

> Living in rented apartments, jamming roads and subways, punching time-clocks, sitting paunchily at desks, cramming the minds of his children with technical knowledge, varying his peacetime routine to hurtle through the sky with his bombs in war, modern man sacrifices health of body and freedom of spirit to the scientific idol of his time. Onto its altar go the smell of earth, the feel of weather, sound of wind and cricket, vision of fields and rivers, warmth of friendship, understanding of children, even the contemplation of God; all these are given over to a metallic, intellectual existence… It should now be branded on our consciousness that unless science is controlled by a greater moral force, it will become the Antichrist prophesied by early Christians.[230]

Lindbergh maintained his anti-technological views for the rest of his life. By the 1960s, Lindbergh had turned fully away from the scientific utopianism he had advocated as a young man. In the early 1970s, he campaigned tirelessly against the development of the SST (supersonic transport), a counterpart to the European Concorde. Inviting the Lindberghs to the launch may have made public relations sense to NASA, but the published account of their impressions further subverted the von Braunian exo-millennial fantasy.

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[229] Charles Lindbergh. *Of Flight and Life*. New York: Charles Scribner's Sons, 1948. p. v.
[230] Ibid, pp. 41-43.

*Earth Shine* was short and direct. In it, Anne Morrow Lindbergh wrote of a side trip taken with her husband to the lush marshes alongside Cape Kennedy. She did not emphasize the technology of spaceflight in her essay, describing the space center as a "computerized beehive," the Lunar Module simulator as "encumbered with boxlike encrustations, as if metal had gone berserk," and the retired rockets themselves as "deadly," the Apollo 8 liftoff as "terrifying." Instead, with every chance she was given, Lindbergh sought to emphasize the humanity and life of the Cape, and in particular the animal life of the marshes inside the space center's domain. Lindbergh mused that the flight of Apollo 8 had perhaps "reconciled… the unnatural rupture between man and the universe," and that the humanity and words of the three astronauts had not given one the sense that they were possessed by "the worship of the dynamo," which she called "that arrogant belief that Western man, with his new scientific and technical powers, now has everything under control and can conquer the universe." Instead, Lindbergh saw in the flight a revival of "a new-old sense of mystery and awe in the face of the vast marvels of the solar system, and a modesty before its laws." According to Lindbergh, a new sense of humility had been granted to too-proud Man – a sense communicated through a new vision of the Earth itself. "We have a new sense of earth's richness and beauty… the only spot of color in a black and gray universe," she wrote.

> We can see our parent earth with detachment, with tenderness, with some shame and pity, but at last also with love… With adult love comes responsibility. We begin to realize how utterly we are earth's children. Perhaps we can now accept our responsibility to earth, and our heritage from it, which we must protect if we are to survive.

While Anne Lindbergh's work was not overtly critical of NASA, it contained none of the valorization of spaceflight one might expect from the wife of an aviator-saint. Lindbergh's prose was always fixed firmly on the Earth, on the flesh and blood within the

machine, and not on the transcendent exo-millennialism and terrestrial escapism with which the NASA Administration and supporters were so possessed.

## THIS ISLAND EARTH

NASA was slow to recognize the emerging power of the Earth as a symbol, and was slow to recognize the manner by which the agency's own photography of the Earth was affecting Americans view of themselves, their planet, and the entire space endeavor. A clue to NASA's blindness to the emerging Earth metaphor can be found in their decision to create a film to celebrate the success of the Apollo 8 mission in January 1969. The 30-minue public relations film is a fascinating glimpse into a space agency desperately trying to win back public support and at the same time advance their extraterrestrialist vision of human destiny. For the film, NASA lined up a series of mainstream and non-controversial commentators drawn from the fields of entertainment, religion, and academics. Historian Arthur Schlesinger, Henry Ford, Ralph Bunche, Bob Hope, Isaac Asimov, and Norman Vincent Peale, all made appearances in the script to the film. Their comments, as well as those of the narrator were consistently tinged with the space agency's interpretation of the spiritual meaning of the flight.

Dr. Norman Vincent Peale, the immensely popular "mind over matter" preacher, claimed that the mission "stimulated an immense rejuvenation of the spirit of mankind." The astronauts, claimed Peale, in contrasting them to the "godless" cosmonauts, possessed a "deep spiritual understanding of the greater world in which God presides."[231] But the summation of the short film, and by syllogism, of the entire mission itself, was left to Eric Hoffer, the "longshoreman philosopher" who enjoyed a brief vogue in the

[231] Gordon Auchincloss. "Debrief: Apollo 8." Final Script. Media Development Division. Motion Picture Branch. Office of Public Affairs. January 4, 1969. p. 31. NASA Historical Files. p. 5.

1960s as Lyndon Johnson's favorite unofficial philosophical voice of the common man. Hoffer's book *The True Believer* (1951) dissected the psychological elements which caused humans to subsume their individuality in mass movements, and quickly became a bestselling and broadly popular indictment of Communism and "isms" in general. Ironically, Hoffer ended up advocating a rather radical tenet of exo-millennialism in *Debrief: Apollo 8*. Hoffer dismissed recent criticism of the space program saying he was "just tickled to death this thing is being done by squares – you know by average Americans. Not by these pretentious intellectuals." But the centerpiece of his remarks was a rather bold and thinly veiled anti-environmental description of the exo-millennial impulse. "I always felt that man is a stranger on this planet.

> A total stranger. I always played with the fancy that maybe a contagion from outer space was the seed of man. Hence our preoccupation with heaven, with the sky, with the stars, with a God who is somewhere out there in outer space. It's a kind of homing impulse.[232]

Hoffer's 'fancy' closely resembled the exo-millennialism of the rocketeers. Perhaps Hoffer did not realize that the rocketeers set out to begin an Earth-denying mass movement, one that he may very well have indicted in *The True Believer* had its influence been stronger.

At the same time that the spiritual enthusiasm for the conquest of the moon resulted in a flurry of exo-millennialist predictions and pronouncements from space enthusiasts and NASA officials, the publishing arm of the agency began to produce full-color photography books which showed that some in the agency were aware of the increasing power of the Earth metaphor. Between 1967 and 1970, the agency published four large books devoted to photographs brought back by the space missions to date. Color photographs of the Earth's surface were first brought back by the Gemini missions,

[232] "Debrief: Apollo 8," p. 31.

most of them obtained via a joint project by NASA's Goddard Space Flight Center and the U.S. Weather Bureau. In 1967, NASA's Office of Technology Utilization published *Earth Photographs from Gemini III, IV, and V*, a large, heavy collection of brilliant color photographs of the Earth's surface. Containing nearly half of the photographs taken during the initial three Gemini missions, the book revealed for the first time to the general public the striking colors and dramatic landforms which compelled the early astronauts to deliver awestruck reports from orbit. "The beauty of this panorama is overwhelming," Friendship 7 astronaut Scott Carpenter said of a sunrise seen from space in 1962. "The brilliance of the colors and the sequence in which they appear defy description."[233] Such books provided the first opportunity for many Americans to glimpse portions of the surface of the Earth as it looked from orbit.

The photographs in *Earth Photographs from Gemini III, IV, and V*, and its successor volume, *Earth Photographs from Gemini VI to XII*, were primarily the result of planned photographic imaging experiments designed to test the ability of spacebound cameras to resolve terrestrial and aquatic features. Tropical storms, typhoons, mountain ranges in Kashmir and Tibet, the Andes, and Iraq, rivers such as the Nile, the Amazon, and the Colorado; the coastlines of Morocco, Algeria, China, Australia, and Florida; islands in the Bahamas, the Philippines, and Japan; deserts in Afghanistan, Egypt, and Texas – all appeared in glorious full color within the pages of these volumes. Despite the undeniable beauty of the images, in the over 266 pages of text, photographs and accompanying captions, not once did the word "beautiful" "stunning," or any other positive (or negative) adjective appear in relation to the content of the images. The images were presented in a distant, scientific, and supposedly objective manner. Instead,

[233] Edgar M. Cortright, ed. *Exploring Space with a Camera*. NASA Special Publication (SP-168). Washington, D.C.: NASA, 1968. p. 138.

the authors, George E. Mueller and Homer E. Newell, both NASA Associate Administrators, wrote passionately in the foreword about the achievement of the photographs only in relation to their claim that manned spaceflight was superior to cheaper, unmanned missions. For them, the Gemini earth photography proved "man's unique ability to control, modify, and reschedule" photo-taking opportunities during spaceflight, and the authors stressed that the Gemini program "has demonstrated that man's unique talents and capabilities are of tremendous value to the conduct of scientific investigations in space."

Robert Gilruth of the Manned Spacecraft Center, who came up with the idea of publishing the book, penned the preface and called the "color in many of the pictures… outstanding" and "ground resolution remarkably high." Yet Gilruth could only meekly conclude his short piece by calling the Earth photography "and other Gemini experiments" the "beginning of a vast increase in man's useful knowledge of Earth and its environment." Similarly, the captions which accompanied each of the photographs contained not a single positive adjective concerning the appearance of Earth from space.

By 1968, NASA was beginning to understand that the photographs of Earth brought back from the Gemini and Apollo missions meant a great deal to the population at large, even if they added little to the space agency's plans and knowledge for extraterrestrial exploitation and colonization. That year, NASA published its first book which had as its particular emphasis selling copies. Seemingly modeled after the Sierra Club's successful series of nature photography books, *Exploring Space with a Camera* opened with a brilliant color frontispiece of the whole Earth as captured by a multicolor camera aboard the ATS-III, the first unmanned NASA spacecraft to be fitted with such a

device.[234] *Exploring Space with a Camera* reproduced many of the images from the earlier *Earth Photographs* volumes, but *Exploring Space* was largely composed of black and white images of the lunar landscape. It became a publishing sensation,, selling over 125,000 copies, the most for any NASA publication before or since.[235] Unlike the *Earth Photographs* series, *Exploring Space with a Camera* was no robotically written, sparsely adjectived collection of photographs. Instead, editor Edgar M. Cortright, Director of the Langley Research Center, spiced up the photo captions with quotes and observations by the scientists, engineers, administrators, and astronauts who either took the photographs or helped design and oversee the space probes responsible for their capture. Furthermore, Cortright peppered the text with appropriate quotes from famous authors, such as John Ruskin, Mark Twain, and William Shakespeare, lending the publication more of an air of a photography and art catalogue than a technological treatise.

In the last few months of 1970 NASA published perhaps their most lavish Earth-centered photography book, entitled *This Island Earth*. Published just a few short months after the first Earth Day, and two years after the Apollo 8 photographs from the moon, *This Island Earth* was partly NASA paean to spaceflight, but mostly an exercise in environmental science and nature writing. Editor Oran W. Nicks attributed the genesis of the volume to the haunting words of the Apollo 8 astronauts Borman, Lovell, and Anders. "Their eyewitness accounts," mused Nicks. "impressed millions of men with the true reality of our situation: the oneness of mankind on this island Earth, as it floats eternally in the silent sea of space." Instead of aiming to trumpet NASA's conquest of space, *This Island Earth* sought to trumpet NASA's unintentional founding of the immensely popular and ubiquitous environmental and ecology movement. "[T]he book was written,"

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[234] The quality of the whole Earth image in *Exploring Space with a Camera* was not high, and the Apollo images would soon usurp the ATS-III images. Much fewer people saw the photo in the book.
[235] *Records of Achievement, NASA Special Publications*. Washington, D.C.: NASA, 1983.

claimed Nicks, "to share with all men a major benefit of our nation's space program – a sobering realization of man's place in the universe."[236]

The combination was both powerful and popular. It quickly became, aside from *Exploring Space with a Camera*, the most popular NASA-published book of all time, selling over 71,000 copies by 1983.[237] Even more than the preceding volumes of earth photography, *This Island Earth* was written for an environmentally conscious and concerned audience. The first sentence of the first chapter set the stage for the tone of the entire text – a tone much different from anything NASA had published before: "A person strolling through a flower garden, enjoying the colors and fragrances, perceives a very different reality than does an ant hurrying along in the dirt, or a hawk lazily orbiting high above." Instead of burdening the text with complex scientific and technological descriptions, the authors geared the prose for an armchair audience. "The new art of space exploration has many rewards," they wrote, "but few are as profound as the rich new perspective we have gained about the planet Earth."[238]

*This Island Earth* did not just use nature writing as window-dressing; it combined such prose with an informed analysis of the environmental catastrophes which could befall the Earth as a result of the excesses of mankind, and not surprisingly, offered NASA technology as a possible aid in identifying and ameliorating these excesses. The book signaled the turn of the agency towards solutions to Earth problems, a turn which would come to increasingly define the agency's self-image in the 1970s. Each chapter

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[236] Oran W. Nicks. *This Island Earth*. NASA Special Publication (SP-250). Washington, D.C.: NASA, 1970. p. vi.

[237] *Records of Achievement, NASA Special Publications.* Washington, D.C.: NASA, 1983. The strong sales of the Earth photography books can most likely be attributed to their prominent position in nearly every edition of the popular *Whole Earth Catalog*. *This Island Earth* would undoubtedly have sold more copies if it had been published as early as *Exploring Space with a Camera*; the *Whole Earth Catalog* had been publishing for two years prior to the publication of *This Island Earth*.

[238] Oran W. Nicks, ed. *This Island Earth*. NASA Special Publication (SP-250). Washington, D.C.: NASA, 1970. p. 3.

focused on a particular aspect of the Earth – its atmosphere, its oceans, the land, its human population – and each chapter shed light on a environmental or geological problem which NASA technology could help solve – pollution, global warming, tectonic shift, and resource depletion. The book was an advertisement to the environmental community for NASA and it was a plea to the baby boomer generation to not de-fund the space program too hastily, lest its technologies prove necessary to discover solutions.

At the same time, *This Island Earth* attempted to reconcile the traditionally spacebound perspective of NASA officials and enthusiasts with the dawning earthbound perspective of those in the ecology and conservation movement. While each chapter began with either a poetic paean to the Earth or a short description of the possible environmental catastrophes which could befall the Earth as a result of the excesses of mankind, each chapter also contained strong endorsements of manned spaceflight and colonization. *This Island Earth* was not an environmental treatise which trumpeted the idea of only "one earth," as other literature from this era suggested, but instead promoted the exportation of Earth's atmosphere and life-forms to neighboring planets. Understanding the mechanisms and dynamics of Earth's atmosphere, suggested the authors, could help mankind discover the means to regulate and alter the atmospheres of Earth's sister planets, Mars and Venus. "For all the rigors of the Martian environment," concluded NASA's writers in the final chapter, "it may prove easy to seed it – biologically, to contaminate it – with fast-spreading, adaptive life of earthly origin." Travel to Mars, and the possible discovery of life on the red planet, claimed the authors, "would dispel forever a part of the loneliness of the human spirit." [239] In attempting to argue for their own relevancy in the emerging Earth Age, NASA found that a legitimate, albeit narrow, path to full-blown space exploration and colonization could be blazed by

[239] *This Island Earth*, p. 176.

appealing to the environmentalist desire for a return to Eden – even if that Eden might eventually be found on a transformed, Earth-spermed Mars.

**Earth Day**

The first Earth Day celebration in April 1970 was a pyrrhic victory for NASA. Inspired at least in part by the photographs of Earth from outer space brought back by the NASA moon missions, the often anti-technological tone of the era's environmentalism was inimical to the agency's technocratic and exo-millennial ideology. The April 22nd event instead became the debutante ball for the newly politically powerful American environmental movement. Above the event flew a new flag – a flag with a photograph of the Earth in the center. The Earth itself had become a sort of celebrity, a symbol, an ancient and yet invigorated symbol, its charisma and power strengthened by the public's familiarity with the language of spaceflight. The planet which at the beginning of the decade, in the utopian frenzy of the Space Age, had seemed to be an old and rather tired home, had become, by the dawn of the 1970s, a social and political symbol of deep power. Just as Sputnik and Carson's *Silent Spring* had been the respective alarms heralding the unexpected birth of the American Space Age and Earth Age, Apollo 8 and Earth Day heralded their maturation. But whereas by Apollo 11 support for space endeavors seemed to be winding down, the Earth Age showed no signs of abating. Despite the landing of men on the moon, there would never be a "Space Day" in the decades to come, only an increasingly compelling and global celebration of an Earth once thought to be left behind and even useless in the heavenward ascension of humanity. More than three decades later, Earth Day is an annual and international event around which the world's attention is focused on threats to the global environment.

Speeches delivered by activists, politicians, and scientists to commemorate the first Earth Day were filled with lamentations about skies darkened with industrial pollution, criticisms of a wasteful capitalist-driven consumer culture, and dire predictions concerning over-population and the proliferation of nuclear and chemical poisons in the soil, foods, and the human body. Yet the symbol of the whole Earth, envisaged now from a distance as simultaneously small, lonely, vulnerable, and utterly destructible, and at the same time utterly total, complete, self-regulating, and ancient, appeared time and time again as the dominant metaphor for a future of endless limits. Artist Alan Gussow, speaking before a large Earth Day crowd in Manhattan's Bryant Park, claimed "The future today isn't what it used to be. We live in a world with two futures, both new and both coexistent… [O]ne view of the future is that no real future exists." For Gussow, the new vision of Earth spoke of a hopeful future, one informed by the global sphere, and not by the "long, flat, endless" future of a past "sense of the Earth." There was no escape from the circle. This new view of the future, which "is what Earth Day is all about… is circular like the whole Earth."

> A circular future means that we cannot escape whatever it is that we do here and now. Life is not linear, it is round. If we pollute the Earth and others do the same the pollution will come up over the horizon one day and destroy us…[240]

The Earth Age and Earth Day generation began to mine the lessons of non-Western, non-Christian cultures in search of the sustainable future they now hoped and believed could be possible. Native American culture, ancient to the land this generation's ancestors had inherited, offered a compellingly apt collection of visions in that through primitive technologies such cultures had lived relatively peaceably for millennia prior to the arrival of Christopher Columbus and Cotton Mather. Kiowa Indian writer N. Scott

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[240] Alan Gussow, "The Future is Circular," in *Earth Day – The Beginning*, New York: Bantam, 1970. pp. 3-4.

Momaday, writing soon after Earth Day, told of the profound effect the Leonid meteor shower of 1833 had on the Kiowa, then living on the open plains of the American Midwest. The event was the earliest memory on the Kiowa calendar; they called it the "winter the stars fell." For Momaday, the meteor storm represented an era in history now gone, when the events of the night sky revealed portents and warnings or comfort and spectacle but always a sense of closeness with the natural order of the Earth. Momaday felt that the American people needed to cultivate a closer relationship with the Earth. "We Americans," he wrote, "need now more than ever before – and indeed more than we know – to imagine who and what we are with respect to the earth and sky." Momaday, echoing the language of American wilderness preservation advocate Aldo Leopold, felt that repositioning the nation beneath a new "earth and sky" would require "an act of the imagination" and the establishment of "the concept of an American land ethic." The separation of humanity from the land and air, a humanity "uprooted" from the Earth by the "Technological Revolution," had resulted in a form of national disorientation, a "psychic dislocation of ourselves in time and space." Americans, Momaday felt, knew where they were "in relation to the supermarket and the next coffee break," but doubted that many of them had any cognition of where they were "in relation to the stars and to the solstices." Appreciation for the natural world, he believed, was ancient and thus "latent in ourselves" and "must now be activated."

> We Americans must now come again to a moral comprehension of the earth and air. We must live according to the principle of a land ethic. The alternative is that we shall not live at all.

Like Momaday, others would see in the vision of the Earth from space a lesson in immanence and even in theology that could sustain the world in the global cultivation of such a land ethic. In his essay, "A Theology of the Earth," written the year humanity first set foot on the moon, scientist Rene Dubos expressed a deep revulsion towards the lunar

surface. For Dubos, the moon was dead, as dead as the heaven L.H. Bailey had imagined a generation before. “How drab and gray, how unappealing and insignificant,” mused Dubos, “this planet would be with the radiance of life." The quest for the moon, for Dubos, had been a journey to a dead land necessary for humanity to recognize the radiance of life on Earth. "The Apollo missions may not have yet discovered much of theoretical interest and practical importance concerning outer space," he admitted, "but they have enabled us to see with our own eyes that the surface of the moon is pockmarked, dusty, gray, and drab.”

The beauty of the Earth from space, compared to the aridity of the other planets, confirmed for Dubos that something innate in the human spirit regarded the Earth as “sacred” for reasons too deep for conscious thought. Modern man, felt Dubos, had progressed to the point where manipulation of the life-giving processes of the Earth by man was a reality too powerful to ignore. This power of manipulation, he wrote, “often makes [man] behave as if he were foreign to the earth and its master.” Such a perspective, Dubos wrote, was “philosophically untenable and destructive" and a "perversion." This perversion, if left uncorrected Dubos felt certain, would "become a fatal disease of technological societies.” But there was hope for a change in perspective, a massive shift in the way the Earth was looked at and treated. “Both polytheism and monotheism are losing their ancient power in the modern world,” Dubos opined, “and for this reason it is commonly assumed that the present age is irreligious. But we may instead be moving to a higher level of religion… We may be about to recapture an experience of harmony, an intimation of the divine… A truly ecological view of the

world has religious overtones… An ethical attitude in the scientific study of nature readily leads to a theology of the earth."[241]

The repulsive moon and the glorious Earth became powerful metaphors for an American public already disenchanted with the budget largesse of the space program. The moon was not just a place few would want to live or work, but a land in the eternal throes of an infinite and lifeless apocalypse, bombarded for eons by meteors, and now by rockets. On the eve of the moon landing, CBS News correspondent Harry Reasoner delivered a depressing commentary on what most in his organization, especially Walter Conkrite, were characterizing as an epochal and millennial event. In his droll voice, Reasoner told millions of viewers that the barrenness of the moon reminded him not of mankind's glorious technological prowess, but instead of the apocalyptic weaponry which had made such an event possible. "The moon of my ignorance," said Reasoner, "is apparently a better place than the moon of fact." He thought it "a depressing thing about all of us that we keep reaching out for strange, unusual and interesting places, and just before we get to them, they begin to seem less strange, less unusual and less interesting... The truth is not nearly so strange or so interesting as the fiction." The moon of the romantics was preferable to Reasoner than the new moon of the rocketeers. "Well, anyway," he drolled, "I guess we're all glad we've gotten to the moon, even though we're sorry in a way that we have to burden our minds with a lot of facts, when we were perfectly happy with a lot of myths about it." Perhaps, Reasoner wryly surmised, the moon's eventual lesson would be the discovery of a more ancient and perhaps more romantic history.

> I do think science has to be careful about concluding that there is not now and never has been life on the moon... Set the date at a million nine hundred thousand

[241] Rene Dubos. "A Theology of the Earth," in *The World of Rene Dubos: A Collection from His Writings*. New York: Henry Holt, 1990. pp. 295-306.

> years after we destroy ourselves with an atomic bomb, or wipe ourselves out with biological warfare, or even just an epidemic of bad colds. How will the earth look then? Will there be the remains of one single initialed belt buckle to betray our past presence? It might look like the moon looks now...[242]

Informed by the images of living Earth, and the new images of the barren moon, Reasoner's commentary united the rockets to the moon with the missiles of apocalypse which had made the entire venture possible in the first place. If the moon was destroyed, and the Earth was alive, and we now had the power to make the Earth like the moon, then the future would be decided by those who sought to dismantle the weapons of apocalypse, who sought to nurture the home planet, and who sought to believe in their own power to do so. In the Earth Age, no other alternative presented itself. From the Earth there would be no escape, no flight beyond before the end. Such ideas became even more romantic than they seemed in the early 1950s, before even one satellite or man had traveled, breathlessly, in a metal cocoon, outside the atmosphere. For the romantics of NASA, the recognition that the new and dawning hope for man would not arise through their exo-millennial dreams, but through an Earth Age inimical to their technology, technocracy, and ideology, resulted in the cutting off of the agency's ascension at the height of their arc. The Peenemunde rocketeers called this moment of release, the point at which the rocket's forward momentum could carry it no higher, *Brenschluss*. Like the V-2s of the London Blitz, NASA's dreams would not float forever in the heavens, but plummet back into the Earth they so longed to escape.

Those at the top of the space agency, however, lobbied hard throughout the 1960s and 1970s to have their vision of a spacebound future accepted by the American public. Even as the nation turned away from the space frontier, the NASA hierarchy advocated a brand of exo-millennialism that they hoped could sustain the agency past the Apollo

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[242]CBS News. *10:56:20 PM EDT 7/20/69: The historic conquest of the moon as reported to the American people by CBS News over the CBS Television Network*. CBS, 1970. pp. 127-28.

missions. While their extraterrestrial enthusiasm motivated few Americans, their words illuminate the desperation felt by exo-millennial true believers when faced with the specter of the Earth – an Earth literally and figuratively rising above their barren moon.

## 6: Technocracy and Exo-Millennialism at NASA

The men at the highest levels in NASA during the Space Age were devoted to a single-minded purpose: the attainment of the moon ground before the Soviet Union. Yet they were also profound believers in the transcendent promise of spaceflight. Like von Braun, top NASA officials such as Hugh Latimer Dryden, Thomas Paine, and James Fletcher were believers not only in the necessity of the United States defeating the Soviets in the space race, but also in the same transcendent exo-millennial dream of human exodus which characterized the philosophies of the original Russian and German founders of rocketry. Using terminology which often employed explicitly Christian language, these men connected the moon missions to a much grander vision of the human conquest of the whole of outer space, and their frequent bold pronouncements on the subject became the dominant manner by which NASA and spaceflight in general was sold to the American public during the 1960s and into the early 1970s. Dryden served as Deputy Administrator of NASA until his death from cancer in 1965. Thomas Paine served as Administrator of NASA during the height of the Apollo program, between 1969 and 1970. James Fletcher served as Administrator of NASA after Paine's departure, from 1971 to 1977, and then was re-appointed Administrator in the wake of the Challenger disaster by President Reagan, serving a second term from 1986 to 1989. While there are many examples of NASA officials, astronauts, engineers, and employees who repeatedly expressed their support for the space endeavor in the context of the exo-millennial dream, these men headed the massive bureaucracy during its nascent years, and it is to their attempts to inspire the American public and most importantly, their employees, with this dream that this section will turn.

As the leaders of a massive federal bureaucracy, these NASA officials were of a different breed than the rocket visionaries which made their organization possible. Their positions were politically appointed and thus precarious. Unlike the metaphysical musings of rocket pioneers such as Tsiolkovsky, Oberth, and von Braun, many of the pronouncements of the NASA officials were rhetorical in nature. In connecting their agency's mission to an extraterrestrial imperative, these officials spoke about an already entrenched dream and thus much of what they said can, and has been, interpreted as tantamount to sales-speak: the selling of space.

However, such a perspective reduces these figures to mere drones in a hive, mouthing words they did not believe for the consumption of a gullible public. It is a incontrovertible fact that Dryden, Paine, and Fletcher were committed believers in the extraterrestrial dream, and a brief look at their lives bears this out. They were not mere names occupying a titular position; they were men who toiled all their lives to make space travel possible. It was their lives' work and their passion. By briefly examining their words in support of the spacebound dream, we can see how extraterrestrial millennialism became the primary justification for spaceflight within NASA.

**Hugh Latimer Dryden, NASA Deputy Adminstrator (1961-1965)**

Hugh L. Dryden, was an impassioned promoter of the exo-millennial dream, as well as a committed and practicing lay Methodist minister. Unlike the half-rocketeer, half-popularizer von Braun, who became the spiritual guru for thousands of NASA employees and space buffs, Dryden's faith in space travel was more muted, more cautious, and many who knew him and worked with him were surprised to discover on his death the depth of his Christian commitment. Von Braun, while circumspect about his conversion in West Texas, and careful to avoid using overtly Christian language in his

early years, only began to connect Christian doctrine to spaceflight after the end of the Apollo missions. Just as Dryden's faith was relatively unknown to his colleagues – despite the fact that he frequently discussed it in the press – von Braun's commitment came as something of a shock to his friends, co-workers, and fans.

In the mid-1930s, Dryden, already well-established in the field of aeronautical engineering, developed a close professional and social friendship with the Hungarian-born and Jewish rocket pioneer Theodore von Karman. The two were called on in 1945 to assist in Project Paperclip, the top secret U.S. Army mission to smuggle Nazi rocketeers, their rockets, and their research out of a recently overrun Germany.[243] Dryden and von Karman, given Army uniforms which identified them respectively as a colonel and a general, were flown to Paris, and then driven overland to the German aeronautics laboratory at Braunschweig, where they questioned scientists and amassed 1500 tons of material relating to aerodynamics and high-speed human physiology. They then split up: von Karman went to Aachen to his former employer, and Dryden went to Munich, where the future NASA Deputy Administrator personally interrogated the recently captured Wernher von Braun and 400 other scientists and technicians from the Nazi rocket center at Peenemunde about the capabilities and whereabouts of the V-2 rocket cache.[244]

In 1949, Dryden became director of NACA, the organization which would become NASA after the launch of Sputnik. Nine years later, Eisenhower appointed Dryden Deputy Administrator of the new NASA, and while he was initially considered

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[243] See Michael Gorn. "A Powerful Friendship: Theodore von Karman and Hugh L.Dryden," NASA, Dryden Flight Research Center monograph. NASA/TM-2003-212031, September 2003. p. 1. http://www.dfrc.nasa.gov/DTRS/2003/PDF/H-2545.pdf

[244] Gorn, pp. 8-9; Von Karman was disillusioned with Project Paperclip on his return from Europe. He called the Army frenzy to import former Nazis a "wholesale roundup" at which military officials behaved like "buyers in a slave market." Von Karman felt the former Nazis would come to the United States for a short time, contribute little, and then return to their homeland even more powerful and knowledgeable than before. See Clarence G. Lasby, *Project Paperclip: German Scientists and the Cold War*. New York: Atheneum, 1971. pp. 103-04.

for the top post, he was passed over for the top position, which would go first to T. Keith Glennan, and then to James Webb. However, Dryden survived the transition between Presidential administrations and served as Deputy Administrator until his death in 1965.

Since his college days at Johns Hopkins, Dryden held a Methodist preacher's license. While in his official capacity as the head of NACA and Deputy Administrator of NASA after WWII, Dryden was very active in the Calvary Methodist Church in Washington, D.C. He taught the Men's Bible Class and made frequent appearances in the pulpit as a lay preacher. Dryden's sermons at Calvary Methodist reflected his character: unassuming, quiet, and possessed of deep faith. He frequently portrayed the journey of man into space as a peaceful and inspirational endeavor, capable of enlarging the hearts of all humans, and serving as a symbol of what humanity could achieve with a trust in God. Manned spaceflight, for Dryden, was a welcome departure from the more militaristic uses of the potentially apocalyptic technologies he had helped create. Dryden avoided the broad optimism in technocracy evinced by his boss, James Webb, and was often more conservative than many around him in his predictions for the capability of humanity to colonize the universe. In Dryden's religious pronouncements and public speeches one can catch a glimpse of the exomillennial philosophy which by the 1960s was vying to be not only the main manner by which spaceflight was sold to the American public and the world, but also a growing force in American Christianity in general. Unlike Webb, von Braun, and certainly unlike Parsons, Dryden knew the responsibility of trying to guide a flock of believing but technologically ambivalent and perhaps fearful Christians through the challenges of living under the shadow of the Bomb and its deliverer, the Rocket.

The major adjunct to Dryden's belief in Christian doctrine was a deep conviction that technology was determining the future, whether humanity liked it or not. As a major

leader in the military establishment, he knew that the Soviets and their atheist philosophy were leaving Christian doctrine and spatial hierarchy behind in their quest for the moon and the stars. Faith in his God, faith in the righteousness of the American people and their battle in the Cold War, and a belief in technological determinism came together in his sermons to support a brand of subdued, conservative, and hopeful exo-millennialism.

In 1950, while Director of NACA, Dryden delivered a sermon at Calvary Methodist entitled "The Importance of Religion in American Life." Written before the Space Age, Dryden concerned himself not with the promise of rocketry, but with the essentiality of developing a modern Christian faith in an age of advancing technology. A Christian technological spirit, Dryden felt, had to triumph over the atheistic technological confidence of the Soviet Union. Humanity and morality, he lamented, was falling behind in the race against the Machine: "We live in an amazing age of science and technology," he declared, "with a jungle legacy of selfishness, lust, and hate, dark passions of human nature, little changed from the time of Adam." Science had certainly brought amazing benefits and freedoms for humanity, he declared. "Through science," he noted, "each of us may have the equivalent of 30 slaves sweating for him without the suffering and shame of human slavery." But the worst result of science, Dryden told his congregants, was the development of Marxism's "materialistic philosophy" which he claimed had resulted in the tragedy of "millions of men" living a "pagan religion." The lack of faith prevalent in the world, was, for Dryden, a "kind of intellectual scurvy" and a "disease." Scientists were not immune from these afflictions, he said, and might even be the most dangerous amongst the ill. This "atrophy of the spiritual life" among the present generation had resulted in the creation of "many who worship reason and the intellectual life, who appear to normal men as egotistical, selfish, and soulless mechanisms." He immediately followed up this observation by quoting Christ. "Jesus said, 'Thou shalt love

the Lord thy God with all thy heart, and with all thy soul, and with all thy mind. This is the first and great commandment.'"

To counter this disease of faith, this loss of the spiritual, Dryden advocated that his congregants rebuild faith in their own lives, but not by acting in a reactionary manner. The new era of technological advance necessitated not a return to the "religion of our fathers and grandfathers" which "like their furniture, their modes of transportation, and their amusements" had "declined" in "value… to nearly zero." Such a religion was "a faint nostalgia" of which only a "memory of their confident faith remains." Instead, modern humanity, besieged by technology, had to "work and struggle and apply our knowledge and skills to the problems of our day." For Dryden, American Christianity had to be brought up to date to compete against a godless technological Communism.[245] And only through Jesus could the battle against Marxist materialism be won.

In 1956, two years prior to his becoming Deputy Administrator of NASA, Dryden delivered an overtly anti-Communist sermon at Calvary Methodist, in which he struggled with the apocalyptic reality of the Nuclear Era. Involved in the construction of rockets capable of transcending oceans, Dryden appeared to anguish over the content of the address. More than half of his typewritten manuscript for the sermon, housed in the NASA Headquarters History files and entitled "The Armament of the Christian," was filled with cross-hatches and instructions to "OMIT," as if he thought better of delivering his original, decidedly more hard-edged version.[246] Based on a militaristic passage in Ephesians 6:10-20,[247] the full, unedited sermon shows Dryden comparing the "spiritual

[245] Dr. Hugh L. Dryden, "The Importance of Religion in American Life," Typewritten manuscript. NASA History Files.

[246] Quotes from omitted sections will be identified as such in footnotes.

[247] Ephesians 6:10-20. "Finally, my brethren, be strong in the Lord, and in the power of his might. Put on the whole armour of God, that ye may be able to stand against the wiles of the devil. For we wrestle not against flesh and blood, but against principalities, against powers, against the rulers of the darkness of this world, against spiritual wickedness in high places. Wherefore take unto you the whole armour of God, that ye may be able to withstand in the evil day, and having done all, to stand. Stand therefore, having your

armaments" of the practicing Christian – "truth, righteousness, faith, prayer"[248] – with the physical armaments of the Cold War – "atomic and hydrogen bombs… airplanes… and intercontinental guided missiles."[249] He characterized the physical armaments then threatening aerial apocalypse as "defensive" and "retaliatory." In defending the nation against the "blows aimed at our innermost moral and spiritual integrity"[250] by the Communist bloc, the true Christian needed to cultivate "spiritual armament systems, both defensive and offensive" alongside a military one. Dryden thought better of including passages in his sermon that characterized the Soviets as "evil" and their leaders tantamount to "a Kaiser, a Hitler, and a Mussolini." He decided to omit a passage that tacitly excused his own involvement in the development of ICBMs by claiming that the "absence of spiritual armament" made "necessary the reliance on airplanes, H bomb, and intercontinental guided missiles." In quoting a long passage by Air Force Chaplain Lt. Colonel Warren E. Ferguson, around which he centered his talk, Dryden omitted a single passage which asked the reader to imagine themselves aboard a hypothetical Enola Gay: "Pretend that you are a crewman on a flight to drop an A-bomb on an enemy target. What would your heart be saying? What would your mind be replying? Would you be so convinced of the moral righteousness of your mission that you would use all your abilities to annihilate your target?"[251] In his sermon, Dryden offered no answer to Ferguson's hypotheticals, although he did leave intact Ferguson's subsequent answer.

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loins girt about with truth, and having on the breastplate of righteousness; And your feet shod with the preparation of the gospel of peace; Above all, taking the shield of faith, wherewith ye shall be able to quench all the fiery darts of the wicked. And take the helmet of salvation, and the sword of the Spirit, which is the word of God: Praying always with all prayer and supplication in the Spirit, and watching thereunto with all perseverance and supplication for all saints; And for me, that utterance may be given unto me, that I may open my mouth boldly, to make known the mystery of the gospel, For which I am an ambassador in bonds: that therein I may speak boldly, as I ought to speak." King James Version.

[248] "truth, righteousness, faith, prayer" in omitted section.

[249] "airplanes" and "intercontinental guided missiles" within omitted section.

[250] "blows aimed at our innermost moral and spiritual integrity" in omitted section.

[251] Passage, as noted, in omitted section.

"The opponents of freedom respect power," Dryden preached, in quoting Ferguson. "Since they defer to strength while flouting moral suasion, we must use power to attain our objectives in international relations. A potential for great power will not meet this need; living, active force, ready for use, is essential to meet current dangers. But we must apply this power in harmony with high moral principle or we will destroy the climate we seek by the methods we use." To combat the opponents of freedom, Dryden claimed, the Christian needed to develop the "shield of faith" which he characterized as a "faith in God who created us and planted within us the moral and spiritual nature which can lift us above the animal level of our earthly bodies."[252] For Dryden, the rockets he developed were the Christian's practical and material answer to the admittedly unproveable power of prayer.

In 1963, speaking before a larger and more technologically-minded flock, the Cleveland-Akron sections of the Institute of Aerospace Sciences, American Rocket Society, and American Society of Mechanical Engineers, Dryden returned to the amorality and "narrow" view of science and the necessity of men of, here unidentified, "religious faith" to lead the nation in the battle in the Cold War. "As well expressed by Robert Oppenheimer," Dryden told the gathered engineers, "the scientist has known sin." Through religious faith, scientists could use the awesome powers they had called forth for moral good. Dryden's answer for the engineers was that they should perform their Cold War and Space Age work within a set of general "social and moral responsibilities," which were non-sectarian and included calls for a "devotion to intellectual honesty and objectivity," a pledge to work within the program of space exploration "in such a manner to obtain maximum benefit for the welfare of the nation and all mankind," an

[252] Passage from "shield of faith" in omitted section. Dr. Hugh L. Dryden, "The Armament of the Christian," Photocopy of typewritten manuscript. 1956. NASA History Files.

attentiveness to "providing… incentives for material and spiritual growth and accomplishment" for "free men in a peaceful world," and "to realize in our job… the highest moral aspirations and ideals of which we are capable."[253]

As Deputy Administrator, Hugh Dryden increasingly saw in the ascension of humanity into space the millennial fulfillment of the Christian message, and the way out of the apocalyptic conundrums presented by technology under the sway of materialism. In other sermons delivered during this period, he held up Jesus Christ as one who "demonstrated to us what we might hope to become." Because humanity was "made in the image of God, a little lower than the angels," all of God's children possessed the ability to "rise above life on a purely physical plane to the realm of the mind…" Through scientific and technological discovery and advance, humanity could "comprehend the intellectual state of its Creator." The leaders of the world, and those under their command and guidance, could create millennial abundance and peace on Earth if they could "discover and understand clearly our tasks." Such discovery, if pursued, could result in the miracle of "our hands, our lips, our brains" becoming "the channels through which the Kingdom of God may come."[254]

In his last five years, as he was slowly dying of cancer, Dryden expressed increasingly exo-millennial hopes for the technology which he had devoted his life to nurturing and creating. Still peaceful and subdued in his prognostications, Dryden hoped, even in the midst of the turbulence of his era, that his life's work could somehow help humanity find a way out of the tunnel, and into the light. In the year before his death, he wrote two pieces, one published, one not, which looked ahead a century, in an attempt to

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[253] Dr. Hugh L. Dryden, "The Social and Moral Responsibilities of Engineers," Speech delivered before the Cleveland-Akron Sections of the Institute of the Aerospace Sciences and the American Rocket Society, and the American Society of Mechanical Engineers, Cleveland, Ohio, February 14, 1963. Copy of typewritten manuscript. NASA Historical Files.

[254] Hugh L. Dryden, unpublished sermons, "In the Image of God," and "Christian Emphasis for Today," NASA Historical Files; passages cited in Noble, *The Religion of Technology*, p. 133.

communicate to those living in his era and in 2064, what he and his colleagues had toiled to accomplish, and hoped that for generations of the future that this work would be looked at as good and just and contributing to a better world.

Like Tsiolkovsky and others involved in the construction of rockets before him, he cautiously expected that space research would encounter extraterrestrial beings with technological powers approaching that of gods or God. In a 1964 article published in a Florida newspaper, he remarked that given that there may be, according to scientists, "at least 100 million planets in our galaxy, alone, capable of sustaining not only life, but intelligent life," it would be "entirely conceivable that a century from today mankind will have communicated with other intelligent beings." Citing astronomer Bernard Lovell's observation that "some life forms may have reached advanced scientific and technical stages difficult for us to imagine," Dryden was optimistic, although he did not expressly say so, that such an encounter could result in technological and civilizational advances for humanity the likes of which could not be foretold. "Expansions of man's geographical horizons," he claimed, "have almost invariably been linked with surges of creativeness in the arts and sciences" and that before the launch of Sputnik, most of humanity believed that "space was the ultimate barrier, forever prisoning men to the planet Earth." Spaceflight, he hoped, again citing contemporary philosophers (and clearly inspired by William James), "could be the first steps toward providing our troubled race with a moral and constructive substitute for war." The venture outward, into the "vastness of space," away from Earth, which he called "one small planet circling a sun-star of relatively minor importance," Dryden hoped would fill all "men… with a wonder and awe that have too long been absent from the consciousness of the human race," and could inspire humanity "to undertake solutions of other so-called 'impossible problems' such as bringing peace to the world and eliminating hunger and poverty." He concluded his article with a

passionate declaration of faith in the work he was involved in since seeing Hubert Latham fly above the *Baltimore Sun* building in 1910, and which he was now still working at, even in his immense suffering. "I also devoutly believe," he declared, "that as mankind moves farther out from our small planet, the glory and light of a billion stars will dispel much of the darkness in the hearts of men."

Dryden's article, entitled "2064: A Warless World?" was one of his last messages, and one of his few widely published ones. Dryden was not an outspoken man, but one who clearly sought to leave his mark upon the world, and who hoped, even in the midst of a terrifying five-year illness, that his life had been worthwhile, and that his cause had been just. He hoped that the organization which he had nurtured into creation would help solve both problems on Earth, as well as solve the technical problem of spaceflight, and it is natural to see that he attempted to reconcile the two spatial goals. Reaching out to God, entering the extraterrestrial environment, within Dryden's spatial hierarchy, could not help but be seen as a parallel, and perhaps the essential, physical journey of humanity next to humanity's 2000+ year old spiritual quest for a replication of the ascending flight of Jesus. Throughout his life, Dryden questioned the morality of science and technology, and struggled to communicate in the language of his era and his faith, a message that could provide humanity deliverance from the horrors of war and potential apocalypse which he had, through his life's work, helped to materialize.

However, Dryden's perspective on spaceflight would always remain wedded to the Christian language of the Bible. Despite his extensive knowledge of engineering and astronautics, Dryden never separated spaceflight from the rapturous transcendence of Earth departure pioneered by Jesus. His desire to better life on Earth through the technologies he helped create always conflicted the with sad reality of their use. Dryden

died hoping for a better world and salvation for both him and the mechanical progeny he developed.

**Thomas Paine, NASA Administrator, 1969-1970**

With the transition of the Executive Branch of government from Democrat Lyndon Johnson to Richard M. Nixon in 1968, the space agency went through a period of transition as well. With both administrations recognizing that the moon landings, conceived under the leadership of a now-martyred President, were untouchable both politically and economically, the transition was comparatively smooth.[255] Appointed Deputy Administrator in January of 1968, Paine was groomed to succeed James Webb. Thomas Paine, unlike Webb, was an avid extraterrestrialist and true believer in the exomillennial dream. Prior to arriving at NASA, Paine was a decorated WWII submarine officer and Navy deep-sea diver, experiences which closely approximated the rigors and dangers of spaceflight. More importantly, however, Paine was manager of the General Electric Company's TEMPO (Technical Military Planning Operation), a long-range planning organization subsidized by GE's Aerospace and Defense divisions, and established in 1956. The organization, deeply involved in the highly classified construction of guided missiles and rocketry, issued brochures which characterized their work as "concerned primarily with the world 5 to 15 years from today" and geared towards anticipating "social, economic, military, technological and political trends which may affect a particular problem." At the time of Paine's departure for NASA, it claimed to be the only long range planning organization sponsored by private industry, and assured its prospective customers that it was devoted to "the selection, design, and employment of weapon systems that will guarantee the survival of the American way of

[255] See John M. Logsdon. *The Decision to Go to the Moon*. Cambridge, MA: MIT Press, 1970.

life."[256] As Webb left the agency, Paine seemed the perfect fit – an energetic, defense industry insider that was not afraid to speak openly about his love for spaceflight and the technocratic values of NASA. Historian Alex Roland called Paine a "space enthusiast of the first order, driven like many of his colleagues in NASA to pursue what he perceived as man's destiny in the heavens." Paine's passion for spaceflight, claimed Roland, approached that "of a religious faith."[257] Paine was passionate about encouraging the American public to envision outer space as a future home, and as NASA entered its most critical period during the Apollo missions, he at first seemed like a perfect choice to "sell" the dream of an American extraterrestrial future to the public.

Paine became Acting Administrator in October 1968 and was fully confirmed by the Senate in March 1969. He left the agency in September 1970. During his two-year stint as Administrator, Paine oversaw every manned Apollo mission from the first crewed orbital launch of Apollo 7, through the lunar rendezvous mission of Apollo 8, the lunar test flights of Apollo 9 and Apollo 10, and the first two lunar landings, Apollo 11 and Apollo 12. Less than six months after the aborted Apollo 13 mission, Paine retired as Administrator and returned to General Electric. With all the theatricality and television surrounding these launches, Johnson and Nixon Administration officials may have seen in Paine an enthusiastic cheerleader for the space dream. However, if that is what they saw, they were setting him up for disappointment, because neither Nixon nor Johnson ever intended to institute the visionary space goals which Paine would come to lobby for and which would partially result in his quick departure from the agency.

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[256] Regents of the University of California, "G.E. TEMPO Collection: Organizational History," *Online Archive of California*, excerpts from TEMPO brochures, 1958 and early 1960s, Accessed February 11, 2004. http://www.oac.cdlib.org/findaid/ark:/13030/tf4p3006zp/bioghist/192320519

[257] Alex Roland. "Barnstorming in Space: The Rise and Fall of the Romantic Era of Spaceflight, 1957-1986." In R. Byerly, ed. *Space Policy Reconsidered*. Boulder, CO: Westview Press, 1989. p. 48.

Paine attempted to remake the position of Administrator into equal parts CEO, preacher, and prophet. He was not afraid to make bold predictions. Only two days after taking office in October 1968, he delivered a speech to the Young Presidents Organization on the subject of the year 2000. Like Webb and Dryden before him, Paine was a self-professed technological determinist. The "thesis" of his talk, he told the gathered executives, "is that technology is the engine of social change." Paine looked backward 32 years, to 1936, and forward 32 years to 2000. Given the pace of technological advance, Paine surmised, there would be in the near future "rapid change in society" with technology continuing to be the "engine of social change."

Throughout the talk, Paine consistently repeated another theme which he would return to again and again throughout his Administration: a Bernallian split in humanity between the technologically adept and the technologically scornful or backward was happening. As the space program, industrial pollution, increasing mechanization, and the war in Vietnam increasingly disturbed Americans who saw in the blind rush to technology the perpetuation of a potentially disastrous cycle, those in the space program began to get testy and defensive. The Young Presidents Speech showed the kind of Administrator Paine would be: not only a firm technological determinist with a deep faith in technocracy, but a prophet who foresaw societal division between the Earthbound and the spacebound as the destiny of the species. For Paine, the pleas of the Earthbound were born of ignorance and not worthy of the respect of the coming extraterrestrial elite.

Paine told the young executives that there were "two kinds of prophets who predict [the] future," the "Science nut" or "optimist," whom he parenthetically identified as himself and the "Classics nut" or "pessimist," exemplified by the outlook in George Orwell's 1984. "Those trained in the classics," Paine lamented in summing up the message of C.P. Snow's book, *The Two Cultures and the Scientific Revolution* (1961),

"seem to feel gloomy and overwhelmed" but the "technically trained see challenge and believe we'll meet it." Before the Administrator launched into his list of predictions for the year 2000, he told his audience to "remember we're looking at leading society" and that "other men will remain in [the] stone age as today." Implicit in this statement was the conviction that the split between the spacebound and Earthbound would yawn even wider than it was at the time.

Paine made a host of outrageous predictions, not terribly unique in their day, but a striking departure from the conservative goal-oriented and technocratic approach of his predecessor James Webb The "Jet Propulsion Revolution" would continue, resulting in the creation a "lunar city," a "Mars outpost," a permanent manned space station, and the "first Deep Space voyages." "What do you predict will be [the] number of men flying in space 32 years from now…?" he asked. "Are you bold enough to say 20,000 per day? 2,000? 200? 20?"[258] The gas turbine, he predicted, would and introduce "automatic up-down-sidewise transport in urban areas" and usher in the creation of the first "3-D 1000-mile radius city" making Vermont a "suburb" of New York City, Nuclear power would be used for space exploration, but not the messy fission kind, since fusion power would be attained by 2000. This would result in the elimination of almost all electric power stations, except for ten. Most education would be via "patient friendly computers that understand English," job sabbaticals for "a year or two" will be routine, three to four day work weeks are standard, and most people would be able to retire by 50. One revolution, which he called a "biological time bomb probably," were artificial organs and cyborg half-men half-machines. He also noted that by 2000, it might be possible for "black skin" and "kinky hair" to be "easily changed by minor adjustment to chromosome."

[258] In 2000, 25 humans flew in space in the entire year.

In general, people would have better health, vigor, and longevity. Cancer and heart disease would be "conquered," birth would be via "artificial placenta," and cyborg technology might result in "artificial animal monsters and human superbeings." In the politicial arena, such technological change and the inexorable need for nations to participate in it would give rise to new multinational organizations. He foresaw the possible unification of England and the United States, and the addition of a 51st state and suggested this might be either "Oceana," Puerto Rico, "West Indies," Israel, England, Ireland, Scotland, Canada, New Zealand, and/or Australia. He seemed taken with the idea of a U.S. annexation of England, Canada, New Zealand and Australia, thus creating an Anglo-Saxon and no doubt predominantly white technological empire. "English TV broadcast around the globe," he surmised, might "provide [a] strong technological impulse toward a 'United English States' with free immigration, commerce, education via international computer networks." He cautioned that such an Anglo-Saxon empire might not be political, but perhaps more in the spirit of a "Transnational Enterprise" like the "IBM of Thomas J. Watson." Combined with his predication of the genetic modification of African racial characteristics, perhaps Paine imagined the eventual creation of a completely white world.

NASA, Paine told the elite coterie of up and coming global industry titans, was showing the world that "a challenged democracy can transform the world" and "<u>without a war</u>."[259] "The future belongs to him who prepares for it," he declared. "We must have a clear vision, set ourselves challenging goals to realize our vision, and organize the institutions of our free society to accomplish what we set out to do." This, according to Paine, was what NASA was "all about." The vision of "man" needed to be upgraded to a "cosmic view," an improvement over the contemporary "view we have of our planet and

[259] Underlining his.

of ourselves." NASA's example, Paine concluded, would bring about a "new renaissance" and the impact of the Sputnik launch on American education was "just starting" and would result "in the long run" in the complete transformation of "our culture."[260]

The divisive exo-millennial overtones in Paine's speech, given little publicity at the time, burst onto the national stage in early 1969. With the triumph of the first Apollo missions, exo-millennialists like Paine became bolder and bolder in their confidence in their visions of the future. In the joyous and celebratory aftermath of the first manned orbit of the moon by Apollo 8, Paine announced at a party attended by engineers and a few select reporters that the journey was "the beginning of a movement that will never stop" and that "[m]an has started his drive out into the universe." But the Apollo 8 achievement and the "movement" which it engendered could not be shared by all; the achievement, he claimed was a "triumph of the squares," whom he identified as “the guys with crewcuts and slide rules who read the Bible and get things done.”[261] Paine's comment, delivered in a climate of societal tumult, immediately grabbed the attention of the press. Upon seeing his comment later quoted on television while at Mission Control watching the recovery operations post-splashdown, Paine turned to the assembled technicians and said “I must have been drunk but it’s true.”[262] In one sentence, Paine let

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[260] Thomas O. Paine, "Notes for Speech on the Year 2000," Summary of Talk Delivered to Young Presidents Organization, Bermuda, October 10, 1968. Copy of typewritten manuscript. NASA Historical Files.

[261] "Triumph of the Squares," *Houston Chronicle*, December 27, 1968. p. 14, Section 1. Also cited in Harford, “The Future for Squares.” ;Elizabeth R. Covert, Secretary to Dr. Paine, Memorandum for Dr. Sherrod, January 17, 1969. NASA History Office. For a debate between would-be space historian Robert Sherrod (Sherrod's notes for a book about the space race which he never wrote are a valuable resource in the NASA History Office) and NASA Public Relations head Julian Scheer over who coined the phrase "triumph of the squares": Philosopher Eric Hoffer or Tom Paine, see Robert Sherrod ("Bob S."), Letter to Julian Scheer, January 5, 1970. NASA History Files. *Time* magazine that week cited Hoffer, who made a similar comment for an Apollo 8 public relations film, *Debrief: Apollo 8*, discussed below.

[262] Paine's admission cited in Elizabeth R. Covert, Secretary to Dr. Paine, Memorandum for Dr. Sherrod, January 17, 1969. NASA History Office.

slip the explicitly Christian exo-millennial will to divide the human species into the ascended and the damned, into the enlightened and the ignorant, and between the conquerors of space and those who would be left behind in a Bernallian zoo on Earth. Perhaps Paine only meant a gibe at the growing chorus of dissenters in the late 1960s who scorned NASA's largesse and technocracy, but the historical and religious roots of his comment lay deep within the rhetoric of rocketry stretching back to Tsiolkovsky and Federov as well as within the rhetoric of Rapture stretching back to Newton and his contemporaries. In an era when NASA's star was rapidly descending in popularity, Paine's remark marred forever the unification rhetoric of space and tempered the public and press adulation which the space program triumph evoked immediately after the flight.

For the rest of his time as Administrator, Paine repeatedly attempted to heal the rift between those he called the "squares" and whoever else was opposing the Apollo program and spaceflight. In July, just before the launch of the Apollo 11 mission to the lunar surface, the Reverend Ralph Abernathy led a mule-drawn "Poor People's March" which converged on the Kennedy Space Center in Florida, and Paine himself traveled out to meet the entourage. By speaking with the group, and hearing their grievances which included a denunciation of the moon shot as an "inhuman priority," Paine was widely credited in the press as defusing what could have otherwise been a tense situation.[263] But his efforts to reach across the divide, from the Space Age to the dawning Earth Age, were not always so successful.

In June 1970, Paine delivered a commencement address at Robert Goddard's alma mater, the Worcester Polytechnic Institute in Worcester, Massachusetts. His talk, "Squareland, Potland, and Space," was meant to poke fun at his own "triumph of the

[263] T.O. Paine, Memorandum for Record, July 17, 1969. NASA History Files.

squares" comment a year earlier but soon descended into nothing more than another divisive call for dissenters to hop on board the space train or get lost. Again, Paine reiterated that there was a great division and "clash" of "social worlds," which he called "for the sake of discussion" 'Potland' and 'Squareland.' Under the heading "Two Worlds at War," Paine outlined the differences between the two "lands." Squareland was "the world you were born and raised in --- the world your parents live in... pillars of society." Potland, on the other hand, was "shadowy and shifting and partly underground."[264] Because Potland was so difficult to pin down, Paine claimed, he asked the graduates and their families to "imagine that Potland has the same establishment structure as Squareland" and that he would "nominate appropriate leaders to help characterize this evanescent new world."

What followed was a patronizing belittling of the contemporary youth culture and space program critics in general. The Supreme Court in Potland would be headed by the Chicago Seven; Potland's Secretary of Agriculture – "who'd radically change crop planting" – would be Timothy Leary. Jane Fonda would be Secretary of the Interior and, according to Paine, her "chief concern would not be making the Indians comfy on Alcatraz, but printing enough 'Keep off the Grass' signs." The Attorney General would be Black Panther founder Bobby Seale, "who would immediately replace J. Edgar Hoover and the entire FBI with the… Hell's Angels." The Department of Defense would be headed by John Lennon and Yoko Ono, "who'd introduce a fleet of yellow submarines, an Army of Blue Meanies, and a melodious Air Force of Led Zeppelins and Jefferson Airplanes."

When he was done dividing the country between those who supported the space program and those who smoked pot and dropped acid, he mused as to the reasons that

[264] Note the spatial language.

Potland had been "driven… into shrill battle" with Squareland. Paine reached deep into the exo-millennial horror show in saying that Potland's "own historians, such as Norman Mailer" had given reasons for battle such as "fears of cultural domination…, of economic reprisal, [and] even of genocide…" Paine himself gave a different reason for the opposition to Squareland: sheer kicks and self-loathing. "Perhaps the excitement of living by plunder rather than the hard discipline of constructive work plays a part," he remarked. "Since Potland's economy is largely based on foreign aid from Squareland, some guilt and animosity toward the donor are probably inevitable."

In describing Squareland, Paine had little but praise. Whereas Potlanders sought an "inward-looking and metaphysical" philosophy, Squarelanders were "outward-looking and mathematical." Potlanders explored with "psychedelic drugs, mystical visions, astrological divinations and metaphysical poetry," while Squarelanders explored with "microscopes, telescopes, computers, and spacecraft." Squareland was "time-oriented… and deeply concerned with future consequences.

> It accepts as true only rational facts and theories which predict future events with mathematical precision and rigorous standards of reproducibility. To the philosophical query "What is truth?," Squarelanders might reply "that which successfully takes two men to the moon." For Squareland truth is pragmatic and powerful – its intellectual triumphs ensure that crops yield, lights light, bridges carry loads, children avoid polio, and men walk on the moon.

Potland, on the other hand was "obsessed with now, at the expense of the future," and for them, Paine claimed, truth was "subjective and aesthetic, non-mathematical, oriented to individual emotional perception." For the Potlander, technology was "inhuman and responsible for the world's problems."

Spaceflight, Paine promised, would not just be a project for Squareland any longer, however. "…[T]he greatest social impact is still to come;" he predicted "the space age as just begun." He tried to appeal to Potland's new sense of the Earth. "Space

developments will soon give man the capability to intelligently monitor and manage this planet's entire biosphere," he predicted, echoing the world-dominating rhetoric of rocketeers from Tsiolkovsky to Dryden. And that was not all: the Potlanders, too, although opposed to the space program today would someday have children who would be a form of extraterrestrial life. "Beyond this lies the more distant but inevitable day," he proclaimed, "when man shall establish new colonies in other worlds, extending the domain of extraterrestrial life, and initiating entirely new human cultures." Even those opposed to the split of the human species would someday come to see the benefit of human ascension into space. After mankind had fully mastered the Earth, and left it behind, all of the Earth's children would have a stake amongst the stars.

And in the end, Paine predicted, Squareland would surely win, because even if the "biological time bomb" of contemporary youth succeeded in tempering the move into space, "a new generation will appear in the universities whom the Class of 1970 cannot understand, and they will declare war on you…. Ah, sweet retribution… We wish you good luck –"[265] For Paine, the split in the species was inevitable, the split in contemporary society merely an aberration which could never seriously affect the bold titans of technocracy.

After his retirement in September 1970, Paine would author dozens of pro-spaceflight articles, all using even bolder exo-millennial rhetoric than that he employed while Administrator. As an advocate for spaceflight, Paine did not have the visibility or charisma of a von Braun, or the Spenglerian and Teutonic personality of an Ehricke. But his use of specifically Christian language was more tempered than that of Dryden, and his message was always patronizing and uncompromising. Paine was the first NASA

[265] Dr. T.O. Paine, "Squareland, Potland and Space," Worcester Polytechnic Commencement Address, June 7, 1970. Copy of typewritten manuscript. NASA Historical Files.

Administrator to temper and channel into secular speech the specifically Christian exo-millennialism which ran rampant through the space agency. Whether outer space held any specifically Christian religious meaning for Paine is unclear, although he did preside over an agency which, during his tenure, endured several controversies over religion. The Apollo 8 moon orbit was accompanied by an astronaut reading of the Book of Genesis, and Paine and the space agency were subsequently sued by Texas atheist and activist Madalyn Murray O'Hair for purposely sponsoring a state religion. At the same time, Paine, an Episcopalian, paid $250,000 out of his own pocket for the installation of the famous overtly religious "space window" in Washington's National Cathedral, and strongly endorsed the construction of a Chapel of the Astronauts on public land alongside the Kennedy Space Center.[266] Paine, even if he avoided Christian language in his exo-millennialism, nevertheless found a lingual medium that allowed him to portray spaceflight as the same escape from apocalypse, off of a suffering Earth, and into a millennial future for all.

Paine's departure from the agency in the late summer of 1970, while officially a retirement, had a great deal to do with the fervency with which he preached the exo-millennial gospel and for his intransigence in accepting a lesser role for the agency post-Apollo. "It has been widely rumored in Washington," wrote NASA Chief Historian Roger Launius, "that the White House had wanted Paine out of NASA because he was adamant in demanding increased funding for NASA…" Unwilling to accept the dimunition of the NASA budget to a fixed $3.2 billion per year, and outspoken about his opposition to the Nixon Administration's lack of enthusiasm for further spaceflight spectaculars, Paine was essentially made to feel as if he should leave. Internal White

[266] See David Noble, *The Religion of Technology*, pp. 134-36 for an account of these controversies and projects during Paine's tenure or in which he was involved after his retirement.

House memos back up this version of events. While searching for a new Administrator in 1971, White House officials discussed their vision of a new NASA. "NASA is – or should be – making a transition from rapid razzle-dazzle growth and glamour to organizational maturity," a February memo between two Nixon Administration staff assistants closely involved in the formation of space policy read, "We need a new Administrator who will turn down NASA's empire-building fervor… In short, we need someone who will work with us rather than against us, and will seek progress toward the President's stated goals, and will shape the program to reflect credit on the President rather than embarrassment."[267] The Nixon Administration was looking for someone quite the opposite of Paine.

After a five month period with Paine's Deputy Administrator, George M. Low, serving as Acting Administrator, the White House found their man in James C. Fletcher. For the next eighteen years of NASA's existence, Fletcher would occupy the role of Administrator for more than half of the time, answering to five different Presidents.

**James C. Fletcher, NASA Administrator 1971-1977; 1986-1989**

The selection of James C. Fletcher to be NASA's Administrator as the era of Apollo moon missions began to fade represented a solidly pragmatic choice on the part of the Nixon White House. For one, Fletcher was a rocketeer himself. As director of the theory and analysis laboratory of Hughes Aircraft Company's electronics division for fifteen years, he presided over several Defense Department projects, including the *Falcon* air-to-air missile and the Air Force's F-102 *Delta Dagger* intercepter. During the 1950s, he headed the guided missile division of the Ramo-Wooldridge Corporation, and later, as

[267] Clay T. Whitehead to Peter M. Flanigan, February 8, 1971, RG 51, NA; cited in Roger D. Launius, "A Western Mormon in Washington, D.C.: James C. Fletcher, NASA, and the Final Frontier," *Pacific Historical Review*, Vol. LXIV, No. 2. May 1995. pp. 222-223.

his division was spun-off into a subsidiary, Space Technologies Laboratories, oversaw the construction of the first intercontinental ballistic missiles (ICBMs). After leaving Hughes, he started up the Space Electronics Corporation, and continued constructing similar massive rockets designed to deliver nuclear payloads wherever the American military saw fit.[268] After he left industry to head the University of Utah in 1964, he expressed relief that he was getting out of the rocket business – but not because of any moral qualms about building such apocalyptic weaponry. "There comes a time when you can do what you feel is important," he told *Newsweek*. "Beyond a certain point more money becomes unimportant."[269]

Aside from his rocketeering credentials, Fletcher's nomination was backed by influential Western Republicans led by Utah Senators Wallace F. Bennett and Frank E. Moss. While Fletcher was not a native westerner himself – he was born in New Jersey – his father was a native Utahn and practicing Mormon. Fletcher's presidency of the University of Utah cemented his credentials among the Western Republicans Nixon was eager to court in advance of the 1972 election. At the same time, while Fletcher was clearly passionate about spaceflight and its possibilities, his less confrontational and more laconic personality and style made him exactly the kind of Administrator the White House wanted as it went about slashing the agency's budget to a shadow of its Space Age largesse.

Fletcher's presided over NASA through periods of decline and controversy. For most of his tenure, manned spaceflight would be a once and future dream; he helped secure funding and presided over the development of the space shuttle, but was out of office long before it ever flew off the planet. His tenure in the late 1980s was occasioned

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[268] Launius, "A Western Mormon in Washington D.C.," p. 219.
[269] "Changing U of U," in *Newsweek*, December 7, 1964, pp. 68-69.

by the Challenger explosion, and while he saw the shuttle return to service, he was Administrator for only three flights. His second tenure under Reagan was also marred by controversy and charges of favoritism over his role in awarding the contract for the booster rockets to a Utah company with which he had close personal and professional ties. There were a smattering of human spaceflight missions in the 1970s – the historic Apollo-Soyuz U.S.-Soviet extraterrestrial rendezvous and the Skylab missions – but for the most part, few Americans entered the heavens during Fletcher's tenures.

Fletcher made up for these lulls in spaceflight by pushing a subtle exo-millennial agenda influenced by his Mormon background. According to Roger Launius, Fletcher's Mormonism influenced his administration of NASA in several ways. First, Fletcher believed in the exploration imperative trumpeted by NASA as the inexorable genetic drive propelling humans into space, and his belief in this, Launius surmised, derived from the strong westering tradition born of Mormonism's exodus trek from Upstate New York to the Great Salt Lake in the mid-nineteenth century. Second, Fletcher adopted Mormonism's stewardship perspective on the natural environment, and was inspired by this to attempt to move NASA more towards an environmental monitoring agency as the space shuttle was being built. Third, Fletcher's belief in the existence and contactability of extraterrestrial life – perhaps extraterrestrial civilizations far more advanced than our own – was directly influenced by the central Mormon belief in the existence of other "earths" in other parts of the universe. Throughout his tenure, Fletcher would attempt to secure funding for the SETI program (Search for Extraterrestrial Life), and personally supported its goals.

While Launius' analysis of Fletcher's influences is accurate, it is perhaps more helpful to examine the Administrator's interests through the lens of a long tradition of exo-millennial belief. Mormonism's extraterrestrial perspective, as discussed previously,

is embedded in the canonical texts channeled by Joseph Smith himself, as well as in his notes and speeches. According to religious history scholar Erich Robert Paul, Joseph Smith's theophanies, or relations of his spiritual experiences, are rife with assumptions concerning the possibility of space travel. Almost all of his early visions and visitations by "messengers"[270] from above, Paul notes – messengers that included Christ, Moroni, John the Baptist, Peter, James, and John – "were actually resurrected beings who had lived in some earlier mortal condition and now were embodied with a tangible, but immortal body." Given that Moroni is depicted in Mormon texts as residing on another world, or planet, Paul concludes that "in secular terminology these 'angels' are the Mormon equivalent of extraterrestrials" and that "[f]or Mormon extraterrestrials to visit the Earth, they must have an understanding of physical laws far in advance of that of twentieth-century science."[271]

As Launius notes, despite this pervasive material extraterrestrialism within Mormonism – which differed from traditional Biblical Christianity in its canonizing through the Book of Mormon the plurality of worlds doctrine – the Mormon hierarchy in the era preceding the Space Age was conservative on the subject of space travel. Joseph Fielding Smith, a Mormon elder and President of the Church of Latter Day Saints from 1970 to 1972, dissuaded Mormons from believing in the exo-millennial promise of deliverance from the Earth during this lifetime. In 1958, he wrote that he felt it was not in keeping with Mormon belief "that mortals should seek dominions beyond this earth while they dwell in mortality. Here we are, and here we should be content to stay." Smith even stated that he believed that not only did God not want humans to leave the planet, but that humanity would be prevented from doing so to any large extent. "The

[270] Erich Robert Paul notes that "angels" was "a term rarely used in Mormon discussion because of the traditional Christian connotation denied by Mormons." Paul, p. 222.
[271] Erich Robert Paul. *Science, Religion and Mormon Cosmology*. Urbana: University of Illinois Press, 1992. p.222.

Lord will permit men to go just so far and no farther," he claimed, "and when they get beyond the proper bounds, he will check them."[272] According to Launius, Fletcher was a member of a group of Mormon intellectuals who successfully challenged this interpretation of the faith, and by the time Fletcher's assumed the Administrator's post, this interpretation had been all but overturned.[273]

In a sense, Fletcher was not only one of the most powerful Mormons in Washington, he was also, as a practicing and believing Mormon, one of the foremost members of the Church who held a civic position through which certain central and popular tenets of the Mormon faith could be propagated. During his tenure, NASA embarked on an ambitious program to scan the cosmos for signs of extraterrestrial life, and Fletcher repeatedly cast this search for other "higher" extraterrestrial civilizations as a possible key to "the survival of the species." This idea of rapid technological elevation through the intercession of an extraterrestrial power, while common in science fiction circles, derives from ancient Christian roots. God, in many manifestations of UFO religions, is essentially a super-intelligent extraterrestrial being, so far ahead of humanity as to to seem omniscient and omnipotent.[274] The extraterrestrial Mormonism practiced by Fletcher in both his public and private life placed civilizations in the universe within a Christian hierarchy of value, stretching from the lowest forms of unicellular life, through Earth's animals, plants, and humans, to extraterrestrial worlds populated by beings of higher evolutionary status. Fletcher's particular interest in technologically advanced forms of extraterrestrial life generally equated technological superiority with *spiritual*

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[272] Joseph Fielding Smith, *Answers to Gospel Questions*. Salt Lake City: Deseret Book Company, 1958. pp. 191-192; cited in Launius, "A Western Mormon," pp. 233-34.
[273] Launius, "A Western Mormon," pp. 233-34.
[274] See chapter "Emergent Apocalyptic Beliefs about UFOs and Extraterrestrial Beings," in Daniel Wojcik's *The End of the World as We Know It: Faith, Fatalism and Apocalypse in America*. New York: New York University Press, 1997.

superiority.[275] It is difficult to find any conception of a malevolent extraterrestrial force in Fletcher's utterances on the matter. At the same time, Fletcher saw the Earth-based quest for such life, through SETI, as part of a spiritual, and personal, quest for truth. In an address to the National Academy of Engineering in November 1975, Fletcher doubted that there was "other intelligent life on the other planets of our Sun" but that it was "likely we would find it among the stars of our galaxy and that is reason enough to initiate the quest." For Fletcher, it was "hard to imagine anything more important than making contact with another intelligent race," an achievement he considered, using telling language, "the most significant achievement of this millennium" and possibly the "key to our survival as a species."[276] The onset of the millennium, Fletcher believed, would bring with it not just contact with higher extraterrestrials. In an interview with the Mormon weekly *Church News* in 1986, Fletcher called humanity's desire to "push back frontiers" a hearkening back to the patriarch Abraham's leaving Ur for Haran. Such a desire, Fletcher foresaw, would "likely" result in space colonization and a human landing on Mars before the millennium was out.[277]

As NASA Administrator, however, Fletcher needed to be careful in his advocacy of visionary projects such as SETI. His predecessor's extraterrestrial enthusiasm had reportedly resulted in a vacancy in the position Fletcher now held. Fletcher was very wary of the political reaction to NASA's funding of such a proposal, a wariness he communicated repeatedly in meetings about the subject with both Ames Director Hans M. Mark and Bernard M. Oliver, Vice-President of Research and Development at Hewlett-Packard, and the nation's foremost private advocate for the search for

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[275] Such an equation has a long pedigree in Western civilization. See Michael Adas. *Machines as the Measure of Men*. Ithaca, New York: Cornell University Press, 1990.

[276] James C. Fletcher, *NASA and the "Now" Syndrome*. From an address delivered at the National Academy of Engineering, November 1975. Washington D.C.: NASA, 1975. NASA History Files; cited in Launius, "A Western Mormon," pp. 232-233.

[277] R. Scott Lloyd. "NASA head is veteran teacher," *Church News*. May 25, 1986. p. 12.

extraterrestrial life until his death in 1995. Both Oliver and Mark believed that NASA should fund a pre-SETI program called Cyclops, and that such funding could motivate the public to support future space missions. "Your concerns over possible adverse political reaction to the proposed study are quite understandable," Oliver wrote Fletcher in September 1973.[278] "I recognize the political problems that are entailed in any project of this kind," Mark wrote Fletcher in a similar commiseration in April 1974.[279] "We intend to keep the lowest possible profile [regarding Cyclops] and we will issue no press releases whatsoever on the subject," Mark told NASA's Associate Administrator of Space Science, John E. Naugle in September 1974.[280] Despite these concerns, Fletcher quietly secured funding for the extraterrestrial life search throughout his tenure in the 1970s and signed off on the publication of at least two NASA-published books on the subject, *Life Beyond Earth and the Mind of Man* (1973) to which he contributed the foreword, and *The Search for Extraterrestrial Intelligence: SETI* (1977). Fletcher's concern was not just limited to political considerations. He at times expressed a not surprising reluctance to commit massive funding of the project due to a rather pessimistic view of the survivability of intelligent cultures. Oliver suggested to him in the September 1973 memo that "the real hidden motive that lay behind NASA's early popularity would be restored" through Cyclops "if we could once more entertain the expectation of finding other life," and that he believed, in responding to a specific query of Fletcher's, that "the probability of success is on the order of unity, that is, not $10^{-1}$ or $10^{-2}$ or less."[281] Fletcher disagreed. "[S]o much depends on what we believe the life expectancy of a high-technology society can be," Fletcher maintained. Modern society was much more

[278] Bernard M. Oliver to James C. Fletcher, September 20, 1973. NASA History Files.
[279] Hans Mark to James C. Fletcher, April 8, 1974. NASA History Files.
[280] Hans Mark to Dr. John E. Naugle, September 10, 1974. NASA History Files.
[281] Bernard M. Oliver to James C. Fletcher, September 20, 1973. NASA History Files.

vulnerable to collapse than those civilizational regimes which preceded it. "In fact, even a thousand years for such a society would make it comparable to Egypt and Byzantine Rome, which as you know had many more stable institutions than our own."[282] In a memo to Hans Mark, Fletcher put the odds of a form of extraterrestrial intelligence existing as "one thousand to one." But the odds of contacting such intelligence were, in Fletcher's estimation, far lower. "[A]dvanced technical civilization" he speculatively observed, was only "100 years (1000 ?)" old. Assuming that all civilizations on all planets went through the same period of technical development, and faced the same issues of apocalypse brought on by the construction of potentially civilization-destroying weaponry, Fletcher was pessimistic about the chances. At the same time, Fletcher was willing to bet on it. He told Mark, "Anyway, it can't be proven. If it could, I'd contribute $1000 (to $1) towards it, wouldn't you?"[283] Fletcher was largely pessimistic about civilization's chances, but saw a slim chance that higher extraterrestrials could bail his fellow lowly earthlings out of the jam.

*The Search for Extraterrestrial Intelligence*, published under Fletcher's tenure as Administrator, expressed a millennial hope for the SETI program. Both the discovery, and non-discovery, of extraterrestrial life promised intellectual rewards. While the process of *not* discovering extraterrestrial life, according to the book, could never be completely proven – "…[T]he conviction of our uniqueness would hardly ever reach certainty; it would form over a long time, less into sharp conclusions than into a kind of substructure of human thought, a ruling consensus of attitudes," the authors surmised – the confirmation of other intelligent life forms could bring hope to a weary and apocalyptic Earth. "…[W]ere we to locate but a single extraterrestrial signal, we would

[282] James C. Fletcher to Bernard M. Oliver, October 4, 1973. NASA History Files.
[283] James C. Fletcher to Hans M. Mark, November 7, 1975. NASA History Files. Also see James C. Fletcher to Hans M. Mark, January 28, 1974. NASA History Files for a similar mix of pessimism combined with personal and financial encouragement.

know immediately one great truth;" the authors claimed, "that it is possible for a civilization to maintain an advanced technological state and *not* destroy itself." And such a confirmation could also bring the dawn of a new and amazing era of contact with lifeforms who might usher humanity into an immediately advanced state of being. The authors intimated that such a new state of being could perhaps bring about the age-old Christian wish for the banishment of death itself. "Some conjecture that we might hear from near-immortals the views of distant and venerable thinkers on the deeper values of conscious beings and their societies!" they exclaimed. "Perhaps we will forever become linked with a chain of rich cultures, a vast galactic network. Who can say?"[284]

Interest in the discovery of extraterrestrial life was certainly not the complete result of Fletcher's religious background. The prospect of such a search is deeply inspiring and intellectually fascinating. Many NASA officials advocated such a search, and the Mormon plurality of worlds doctrine was certainly not the prime mover in the broader interest in the subject at the agency and beyond. Yet Fletcher's personal interest in the project was allied to his worldview, and the Mormon worldview, after all, arose in a mid-nineteenth century religious climate of increasing excitement over the possibility of life on other worlds. And the Mormon worldview was itself the product of a deeper Christian hierarchy of celestial value embedded within the very language of the canonical text of Christianity. Not only did Mormon cosmology posit the existence of "millions" of earths, it retained the concept of an utterly debased Earth even given the plethora of worlds. Such a retention can be seen in *The Pearl of Great Price*, where God purportedly told Moses, "Wherefore, I can stretch forth mine hands and hold all creation which I have made, and mine eye can pierce them also, and among all the workmanship of mine hands

[284] Philip Morrison, John Billingham, and John Wolfe. *The Search for Extraterrestrial Intelligence*. NASA SP-419. Washington, D.C.: NASA, 1977. pp. 7-8.

there has not been so great wickedness as among thy brethren." According to Erich Robert Paul, this passage in the Book of Moses became an additional basis in Mormon thought (alongside previous Biblical language to this effect) for the Earth to be considered "the most wicked of all worlds."[285] In traditional Christian thought, predicated upon a Biblical and medieval conception of heaven and Earth, the wicked nature of the planet necessitates an imitation of Christ's departure upon the part of the elect during the Last Days; in Mormon thought, such terrestrial wickedness necessitates a similar departure, perhaps at a similar apocalyptic juncture, but now such ascension is to any number of celestial bodies in a newly material and inhabitable cosmos.

As a result, the search for extraterrestrial life, in a reading cognizant of the Christian hierarchy of values which gave rise to the birth of modern astronomy and the assumption of celestial divinity in the first instance, becomes, as Jet Propulsion Laboratory director Bruce Murray commented in 1979, "like looking for God."[286] One imagines that for Fletcher, and for others, such a quest is not just *like* looking for God; in the context of Mormon cosmology, as well as in the context of an older Christian cosmology which also posited the seat of divinity as necessarily far away from the terrestrial sphere, such a search can become, and is, looking for God.

The search for extraterrestrial life, itself an exo-millennial manifestation of the search for God and divinity, was not the only dream of space which Fletcher attempted to stoke during his time as Administrator. Like Administrators before him, Fletcher was involved in the whole panoply of extraterrestrial endeavors, and tacitly exomillennial endeavors, that comprised the spacebound dream. He oversaw the funding and construction of the first space shuttle, designed as part of a long range von Braunian

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[285] Paul, *Science, Religion, and Mormon Cosmology*. pp. 87-88.
[286] Jet Propulsion Laboratory, JPL News Clips, May 8, 1979; cited in Noble, p. 134.

vision of shuttle-dockable space stations and permanent manned bases on the Moon and Mars. In addition to overseeing the funding of Cyclops and SETI, Fletcher helped initiate an expensive, but largely fruitless, quest for extraterrestrial life on Mars, through the funding of the Viking Program. And as we shall see in a later series of chapters, Fletcher presided over the agency when it funded the study of the boldest manifestation of the exomillennial dream ever sponsored by a state technocracy: the space colonization vision of physicist Gerard K. O'Neill.

However, it would be unfair to characterize Fletcher's tenure as completely based on the exo-millennial vision. By the 1970s, NASA had matured into a permanent part of the American government, and one of the few attention-getting federal agencies. Despite the decline of funding after the Apollo missions, the NASA dream propagated by many in its employ inspired Americans from all walks of life to become interested in the planets, stars, and galaxies in the celestial firmament, and to see in the exploration of outer space a chance to use science and technology for peaceful and perhaps wise ends. NASA, during Fletcher's tenure, was an agency that finally began to become more educative than militaristic and conquest-oriented. For this, there can be little criticism. NASA, through the inspiration of the moon landings, and through the attempt by President Kennedy to transcend the apocalyptic uses of dormant missile stocks by using them to provoke inspiration for the Earth and the extraterrestrial environment, entered the 1970s not as an agency just withered and weak, but as one humbled by the vision of a universe far different from the one the exomillennial consciousness prevalent in the space exploration community initially assumed would be discovered.

# 7: THE EARTH WILL BE DESTROYED: The Rise of Evangelical Apocalypticism Post-Whole Earth Photographs

The seeming fragility of the Earth as seen from space may have inspired some in the environmental movement to campaign for a more nurturing, respectful stance towards the planet, but this was hardly the only lesson taken away from the view. For a rising tide of evangelical and fundamentalist Christians, the vision of the Earth from space, and the apocalyptic technologies which made it possible, heralded the inevitable coming of Christ. The fundamentalist reaction to the emerging Earth Age revived the Earth disdain of the early rocketeers, even to the point of creating acquiescence and support for the invention of apocalyptic weaponry, and a tacit hope for the long-prophesied cleansing of the Earth by fire and the elevation of Christian man into the sky. As it became clear that the utopian dreams of human colonization of space through rocketry were not only difficult, but perhaps undesirable given the deadliness of the extraterrestrial environment, the rapture myth of Christian millennialism re-emerged to re-enchant the cosmos with a spiritual promise of ascension.

The evangelical perspective of the Earth as an abode of iniquity and sin carried well over into the twentieth century, and as we have seen, was echoed in the worldviews and metaphysical speculations of the most influential of the rocketeers. Such a cognition hinged partially on the fundamentalist conception that the Earth was no more than 6000 years old. A young Earth was a less certain Earth.

The notion that terrestrial warfare was technologizing toward an apocalyptic and God-decreed end did not begin in the atomic era, but began soon after the American Civil War. Machine guns, rockets, cannons, and explosives tore up not only human bodies, but the very Earth itself. Biblical literalists saw in this destruction the coming intimation of

global Armageddon long before Hiroshima and Nagasaki. As the First World War still raged, the Seventh Day Adventist W.A. Spicer wrote in his book *Our Day in the Light of Prophecy* that global political unrest was paving the way to Armageddon. Spicer painted a broad historical view of military advances. "The beginning of the modern race of armaments may be dated from those stirring and eventful years of 1830 to 1848," Spicer wrote, referring specifically to the halcyon days of William Miller's prophetic ministry. "We have seen the resources of the soil and the inventive genius of man devoted to preparations for war on a scale never before thought of." Spicer cited passages from Joel, Isaiah, and the Book of Revelation as proof that the fiery end will not be diverted, even by frantic attempts by some for peace. "We are told that many people in the last days will be saying that swords are to beaten into plowshares, and that the nations will cease from war," Spicer noted, but went on to caution, as prophecy writers to the present day have cautioned, that this will be a ruse, a temporary and diversionary tactic of Satan in preparation for the final assault. "[B]ut the actual conditions are repeatedly described in prophecy as warlike and perilous… What we seen then among the nations proclaims the approaching end."[287] Spicer quoted from a 1911 article in *Literary Digest* to illustrate his view that the world was rapidly approaching a militaristic Armageddon.

> Never was national and racial feeling upon earth than it is now. Never was preparation for war so tremendous and so sustained. Never was striking power so swift and so terribly formidable… The shadow of conflict and of displacement greater than any which mankind has known since Attila and his Huns were stayed at Chalons, is visibly impending over the world. Almost can the ear of imagination hear the gathering of the legions for the fiery trial of peoples, a sound vast as the trumpet of the Lord of hosts.[288]

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[287] W.A. Spicer, *Our Day in the Light of Prophecy.* Washington, D.C.: Review and Herald Publishing Association, 1917. pp. 107-109.
[288] Spicer, p. 341.

Spicer punctuated his book with photographs of battleships, mortar rounds, and wounded soldiers, beneath which he placed Biblical passages such as Joel 3:14: "The day of the Lord is near."[289]

In a 1929 astronomy book, published by evangelist Dwight L. Moody's Bible Institute Colportage Association, author Clarence H. Benson describes the creation of the universe and the history of the earth. Entitled *The Earth, the Theater of the Universe*, Benson's book describes the Earth as divinely created by God, but then tested, and "regained" by the diabolical Satan. Through Satan's influence, a "fourfold" curse befell the planet – a curse on the serpent, a curse on woman, a curse on man, and finally, a curse upon the earth. Because of this curse, Benson writes, the Earth can only be redeemed and again be made the center of the universe through a purification by fire. "Some great celestial catastrophe," writes Benson, "might completely alter conditions upon the earth… This planet will be marvelously prepared for the last and most distinguished period of its history."[290]

Much of post-Space Age fundamentalist prophecy built on the firm foundation laid down in the 1950s Nuclear Era. The bomb technologized the apocalypse for believing Christians, and offered the instantaneous, push-of-the-button immediacy that previous apocalyptic anticipation lacked, forced instead to wait for deliverance through the collision of a God-directed comet, or an amorphous firestorm from above. The acceptance of atomic warfare which can only be described as apocalyptic played into the hands of those clergymen who most fervently exhorted their congregations to beware the wrath of God. In the 1950s, such wrath was no longer supernatural; it was technological, and its threat was growing. At a September 1949 revival in Los Angeles, held two days

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[289] Spicer, p. 109.
[290] Clarence H. Benson. *The Earth, the Theater of the Universe*. Chicago: Bible Institute Colportage Association, 1929. pp. 67-68; 134.

after President Truman announced the first Soviet test of an atomic bomb, Reverend Billy Graham sounded the cry of the coming end. “An arms race unprecedented in the history of the world is driving us madly toward destruction!” he thundered. Graham stressed not only the destructive potential of the bomb, but the imminence of its employment in the American skies. “Mr. Truman said in yesterday’s press conference that we must be prepared for *any* eventuality at *any* hour…” But Graham comforted his audience with the thought that the acceptance of God would make such devilish events and the troubling thoughts they engendered irrelevant. “We don’t know how soon, but we do know this, that right now the grace of God can still save a poor lost sinner.” Boyer noted that Graham’s sermon was notable more for what it lacked than what it contained. “Graham made no comment on the morality of atomic weapons. He offered no ideas for reducing the atomic threat which Christians might support.”[291]

The Earth-Space dichotomy of the 1960s offered a host of metaphorical and literary fodder for evangelical extrapolation. As the Apollo 8 astronauts looked out their window at an approaching blue-green oasis Earth, Pentecostal Reverend Stanley Berg gave a rousing sermon to his Manhattan congregation. Berg restated the evangelical connection between the dawning age of space travel and the skyward ascension of Jesus and the elect. “I’m not saying the Lord Jesus had to go down to a launching pad in Florida,” he preached, his message punctuated by cries of “Amen” and “Hallelujah” from the audience, “But the fact is, He too left the world.”[292] Consigned to the Rapture for ascension and its attendant holocaust, American fundamentalists embraced Biblical accounts with a new zeal.

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[291] Paul Boyer. *By the Bomb's Early Light*. New York: Pantheon, 1985. p. 239.
[292] “Churches Mirror Apollo’s Verses,” *New York Times*, December 26, 1968. p. 41.

Historian Paul Boyer, whose book *When Time Shall Be No More* is an exhaustive look at American prophecy belief, wrote that "popular attention to biblical prophecy… unquestionably intensified after 1970."[293] Throughout the 1970s, in contrast to an increasingly secular outlook on world affairs held in Western Europe, prophecy and fundamentalist literature grew ever more popular in the United States. Boyer attributed this surge to the blossoming of several decades worth of prophetic speculation concerning the impact of nuclear proliferation, but gave no definite reason for such a surge during that particular year. However, the surge of prophecy belief during 1970 and beyond is directly attributable to the advent of space flight, and the epochal achievement and psychological impact of the photographs of Earth from outer space. Just as the dire warnings of Earth destruction resonated with the protest-era generation, the dire warnings of Earth destruction and fragility resonated with a post-Apollo Christian fundamentalist generation. At the same time, the Space Age had given the premillennialist expectation of the Rapture a new and curious analogue in manned spaceflight, and perhaps space colonization.

Post-1970 prophecy writers were not saying anything new, but just dressing up an older interpretation in technologically more fitting clothing. The Earth was in danger of imminent destruction, and such destruction should be gleefully welcomed as a brief passage to a gloriously heavenbound future. Idaho Baptist minister Robert Gromacki, in his book *Are These the Last Days?*, published in the midst of the Apollo missions, reflected the fatalistic terrestrial outlook that many American fundamentalists began to adopt as the Space Age ended. Gromacki thought that the horrors of the apocalypse could not truly be said to be bad, since they would enable a glorious and risen future for believers. "Although Armageddon will be an awesome and terrifying experience for the

[293] Boyer. *When Time Shall Be No More*. p. 11.

world," he explained, "it should be welcomed by the child of God as the day of vindication of our holy and sovereign Creator." In other words, nuclear destruction would prove, ghoulishly, that God existed. "Many beneficial results will be produced by this great battle," he observed. "What then should be the believer's attitude to the destruction of the world by fire? First of all, he should welcome it and pray for its nearness."[294] Space Age rockets would not save humanity from the apocalypse, in the post-1970 Christian fundamentalist mind; instead, their cousins, the nuclear-armed missiles, their numbers dwarfing the periodic spacebound rockets sitting lonely on the pad, which would deliver humanity from an Earth God had directed the kings of the planet to prepare to destroy.

By far the most popular prophecy book of the era, and indeed the best-selling non-fiction book of the 1970s, would be Hal Lindsey's *The Late Great Planet Earth*. While previous prophecy writers had talked of wars, and rumors of wars, Lindsey's major innovation would be his use of the Earth motif in both his title, and in the frightening and apocalyptic covers which graced his books. By 1980, Lindsey's book had sold at least eighteen million copies worldwide, easily making it the bestselling non-fiction book of the entire decade.[295] By 1990, *The Late Great Planet Earth* had sold 28 million copies and today estimated sales figures stand at close to 50 million copies in print.[296] And Lindsey did not stop employing the threatened Earth motif with *The Late Great Planet Earth;* in 1972, he published a follow-up prophecy title, *Satan is Alive and Well on Planet Earth*, and two years later, *The Liberation of Planet Earth*.

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[294] See Boyer, *When Time Shall Be No More*, p. 135.

[295] "About the Authors," in *The Late Great Planet Earth*. 1970 (c1983). p. 181.

[296] Conversation with Hal Lindsey Website Ministries, July 27, 2004. Religious publishers constantly overestimate the number of copies in print, and Lindsey's books are commonly distributed for free by churches and religious groups to members and others who never read them, but these figures are reasonably accurate and reflect the enormous popularity of the title.

Lindsey's book represented nothing new in its promise of imminent global destruction. Using material recycled from his lecture notes at Dallas Theological Seminary, Lindsey merely modernized Biblical-inspired fatalism for a post-Apollo, countercultural generation, titling the chapters of his many books with groovy monikers like "The Weirdo Beast," and "The Ultimate Trip." Lindsey was careful to use precise and up-to-date military and social terminology in naming the weapons and scourges which would incite the apocalypse and make real the Rapture. Drug addiction, ballistic missiles, parapsychology, astrology, black magic, "Oriental" religions, pollution, hydrogen bombs, and Cobra helicopters all make appearances amidst Biblical passages purported to presage their arrival, and of course, their quick and fiery immolation. His maps detailing the movements of the armies of "Gog and Magog," or Russia and China, resembled so many Vietnam War-era counter-insurgency planning charts generated by Pentagon brass. But even these innovations do not fully explain the popularity of his prophetic treatise. Lindsey's book was not just wildly popular; it single-handedly revolutionized the field of prophecy literature. The only color artwork associated with the entire fatalistic book may have had a lot to do with the book's popularity. The cover of *The Late Great Planet Earth*, for most of the editions published in the 1970s, featured a blue Earth, trailed by a burning tail of fire, arcing through space, presumably on its way to a final impact. Other editions featured an Earth, awash in a sea of flames. Besides being the biggest selling book of the 1970s, it was also the most widely printed book to feature the newly photographed Earth on the cover, certainly surpassing in sales any environmental or astronautical titles with a similar motif. It is no exaggeration to say that the most popular books about the Earth in the era following the first photographs of Earth were those macabre titles which fatalistically and predicted the imminent destruction of the Earth.

The attraction of Lindsey's book was that it related in often childishly simplistic language the "signs" in world events which foretold of a fulfillment of premillennial prophecy in the last years of the twentieth century. In contrast to the desire in environmentalist literature to prevent the destruction of the Earth and its resources, the message in Lindsey's book was clear and unambiguous: the Earth was destined to be destroyed or "purified" by nuclear war; there is nothing good Christians could (or should) do about this inevitable prophecy; and those blessed enough would be transported off of the Earth prior to the great "tribulation" in a form of extraterrestrial rapture. Whereas Earth Day was concerned with cultivating a global ethic of Earth nurturance and respect, Lindsey's *Late Great Planet Earth* was concerned only with correctly identifying the circumstances, and perhaps the time, of the planet's destruction and humanity's final departure. Such evangelical acquiescence in the face of Earth's destruction all but proved Lynn White's observation that traditional Christianity, in its baldest and most literal forms, was not only anti-environmental or anti-Earth, but perhaps possessed of a dark and intransigent global death wish.

Lindsey mentioned the space program only once in *The Late Great Planet Earth*, but his mention was, predictably, in regard to the inevitable Rapture of the believers. In his chapter "The Ultimate Trip," Lindsey compared this "ultimate trip" to the Apollo space program. "Science fiction had prepared man for the incredible feats of the astronauts," Lindsey wrote, in attempting to appeal to a generation raised on comic books and trash fiction. "but when the reality of the moon landing really hit, it was awesome." Yet for all the wonder of man's stepping on the moon, claimed Lindsey, nothing would compare to what God had in store for humanity. "Astounding as man's trip to the moon is, there is another trip which many men, women, and children will take some day which will leave the rest of the world gasping… Without benefit of science, space suits, or

interplanetary rockets, there will be those who will be transported into a glorious place more beautiful, more awesome, than we can possibly comprehend. Earth and all its thrills, excitement, and pleasures will be nothing in contrast to this great event."[297] Forget about the space program's pathetic rapture, Lindsey told his readers, the real thing was bound to be much, much cooler.

Both Lindsey's book and the environmental literature being released at the same time possessed similar streaks of scaremongering apocalypticism. Perhaps it was something in the image of the entire planet from the depths of space which shook the American psyche to its very foundations, as if one were looking in a mirror for the first time, realizing that not only one's life, but the life of everyone on Earth, could be snuffed out in the blink of an eye. In a culture as steeped in Christian millennialism as the United States, the sight of the Earth from outer space could perhaps not help but be met with the reaction or expectation that it would and could imminently explode in a violent cataclysm, like Superman's Krypton.

Other writers avoided mentioning the Earth's various space technocracies, but a rich literature concerned with the demonic nature of Satan's own extraterrestrial deceivers became popular among Christian fundamentalists. In John Weldon and Zola Levitt's 1976 Lindseyesque prophecy manual, *UFOs: What on Earth is Happening?*, the authors hypothesized that the flying saucer phenomenon was a vast and conspiratorial deception hatched by Satan. UFOs, Weldon and Levitt maintained, do not actually exist, but are a facet of a complex and demonic end-time scenario straight out of the Father of Lies box of tricks. "With the powers we know demons have," the authors state, "they could *theoretically* transform a large chunk of rock into a UFO, assume human form inside of it, and land openly, thus 'proving' the existence of advanced intergalactic civilizations."

[297] Hal Lindsey. *The Late Great Planet Earth*. New York: Bantam, 1970 (c1983). p. 124.

A more likely demonic strategy, however, is that the demons are utilizing some property of magnetic fields, “or some other phenomenon we as yet know nothing about, to affect the perceptions of those who see or contact them.”[298] Such quasi-technological explanations were necessary for fundamentalists who demanded a materialistic justification for all apocalyptic phenomena, even those of the Horned One.

Through these earthly contacts, the UFO/demons hatch occultic ideas in the minds of followers thus steering them away from the simple and redemptive message of the Bible. “They [the demons] set the stage for a supernatural, or at least extraterrestrial, solution for world problems; and then they attack the credence of the Scriptures, the true solution.” Zola and Levitt were impressed by the Devil’s craftiness: “We’ll have to hand it to Satan. He’s still the most subtle beast in the field.”[299] Lindsey would later pick up on this Space Age UFO as demonic deception motif, claiming that the sudden appearance of UFOs in the skies over America might set the stage for the rise of the Antichrist, who would unite the world's peoples against, or on behalf of, the superior extraterrestrial threat. "To be blunt," Lindsey admitted in describing his belief about the identity of the UFO pilots, "I think they are demons." Lindsey cited NASA Administrator James C. Fletcher as one of those who had seen the discovery of extraterrestrial life as an event that "would eclipse all previous discoveries of mankind." The rash of sightings and prevalence of UFO belief in the Russia was proof positive that the atheistic nation was being coerced into a New Age one world religion by Satan, believed Lindsey, and the description of aliens by prominent UFO "abductees" such as Whitley Streiber as "demons" or "angels." Multiculturalism, the United Nations, the 1993 Parliament of World Religions, New Age religions, "environmentalist extremists," and even the

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[298] John Weldon with Zola Levitt. *UFOs: What on Earth is Happening? The Coming Invasion*. Bantam Books: New York, 1976. p. 147.
[299] Weldon & Levitt, p. 152.

"Eastern" ideas of *Star Trek* were preparing the world for unity under a supposedly peace-loving Antichrist, Lindsey claimed.[300] Space for the fundamentalist was a place of demons where Satan, "the Prince and Power of the Air," reigned supreme. Such ideas certainly did not benefit the space program, except by repeatedly identifying the above with the Rapture and heaven, and the below with turmoil, discord, apocalypse, and sin deserving of eternal punishment. NASA and fundamentalism formed an uneasy alliance in the late 60s and early 70s. They held a common valorization of the spatial hierarchy, but whereas space enthusiasts saw technological ascension as the only way off of a doomed planet, fundamentalists waited for the mystical ascension of the Rapture. Their support for the space program, if any, was one of acquiescence to technological proliferation as a sign of the End, and not due to active enthusiasm.

In the early 1980s, author and cultural observer A.J. Mojtabai visited an Amarillo, Texas community surrounding the U.S. Department of Energy's Pantex Facility, the final assembly plant for all nuclear weapons manufactured in the United States. Mojtabai attended various fundamentalist churches in Amarillo in an attempt to figure out how millennial and apocalyptic belief influenced and shaped congregants feelings about the facility within which many of their relatives worked. She discovered that the fundamentalist faith of those who lived in the community created an insularity, and a "fragmenting and privatizing of the Christian message," inimical to charity outside a core group of believers. In her interview with the Reverend Darrel Gilbertson, a self-described moderate in an inland sea of conservative Christianity, Gilbertson claimed that the cross in his community was "somehow missing its horizontal bar. It has only this stark verticality." In her journeys through Amarillo's religious web, she discovered how Amarillo fundamentalists were immersed in a spiritual matrix focused almost completely

[300] *Planet Earth – 2000 A.D.: Will Mankind Survive?*, pp. 29-78.

on transcendence from the perceived increasingly hellish conditions upon the Earth, and almost completely numbed to the presence of the Pantex plant, viewing it as if through an otherworldly and detached perspective. One of the livelier churches she visited, was the Jubilee Tabernacle, a Pentecostal Church composed of congregant who, in her words, lived "with the most insistent, clearest certainty of being the terminal generation, and are the most outspoken about it." She described a particular sermon by the electric pastor, the Reverend Royce Elms, in which he illustrated how contemporary fundamentalists viewed the technology of spaceflight. For Elms and his congregation, spaceflight was a tinker toy rapture compared to the imminent glory of the real thing. "You know they're spending a fortune on this space program. A fortune! If they'd just shut it all down, see, and wait for the sound of the trumpet, that, my friend, is going to be one space program!" Elms exclaimed during the sermon. "I never even put my name in to be an astronaut on this little rinky-dink thing they got going on now."

Motjabai observed, as a result of her research in Amarillo, that the Rapture fantasies of Christian fundamentalists mitigated against political action on behalf of any earthly cause. Such beliefs, one can see from the above passage, also mitigate against the exo-millennial ideology of the rocketeers, and in a belief that in rockets lie the path to earthly transcendence. But Mojtabai also saw in the popularity of the Rapture myth an escape from a miserable planet – a belief that paralleled, if not endorsed, extraterrestrial millennialism. "The panoramas of destruction" of the Christian apocalypse, she wrote, "depicted in loving detail, with no human solution offered but flight from the world, are helping to create the conditions through which they become scenes from a self-fulfilling prophecy."[301] In an eerily similar way, the belief that rockets represented a path to the

[301] A.G. Mojtabai, *Blessed Assurance: At Home with the Bomb in Amarillo, Texas*. New York: Houghton Mifflin, 1986. p. 163.

divine, held by rocketeers since the late nineteenth century writings of Federov and Tsiolkovsky, also held within them a self-fulfilling prophecy. The Earth is bad and it must be left; the Earth is bad because of the proliferation of apocalyptic weaponry, and it must be left. Thus, as if in a race against the end of time, the rocketeers endeavored to fashion even more apocalyptic weaponry, use it to provide an elite with an escape from a doomed planet, and, in leaving the bulk of the rockets they created below, tacitly allow them to be used in the service of the governments of Earth in the fulfillment of Armageddon. Exo-millennial and fundamentalist belief were not mutually exclusive, but uneasy co-partners in a common dream of ascension and terrestrial annihilation. That they inspired different constituencies did not mean that their means and ends were all that dissimilar.

In the autumn before the publication of Lindsey's treatise, Princeton physicist Gerard O'Neill asked his students whether Earth was the "right place for an expanding technological civilization." O'Neill imagined, resurrecting the dormant exo-millennial will of the rocketeers, that only through escaping the planet could humanity be saved. But O'Neill's idea would differ from those of many of the rocketeers in a way that explains the persuasiveness of his vision for many seeking transcendence from the Earth's problems in the post-Apollo age. Instead of recycling the von Braunian idea of erecting bases and colonies on the Moon or Mars, O'Neill disposed of planetary colonization altogether. True space rapture would not be found, O'Neill intimated, in another heavenly body's confining gravity. As for Tsiolkovsky, Oberth, and von Braun, gravity was a form of death, a prison from which mankind had to escape at all costs. O'Neill's colonies would pave the way for a kind of mechanical realization of Lindsey's imminent Rapture, and at the same time a kind of ecological realization of the environmental

movement's dream of ridding the Earth altogether of a host of perceived apocalyptic technologies.

The affinities between O'Neill and Lindsey's visions were not mere coincidence. Both visions were inspired by the Space Age's elevation of the metaphor of the Earth. Both visions promised a form of escape from a dismal terrestrial existence. Both rejected a sustainable future on the planet in favor of a weightless, material existence in the sky. Both retained a deep pessimism concerning Earthly affairs, and a boundless and utopian optimism about an imminent release from the messy business of living on Earth. And in the end, both visions also possessed deep roots in the Christian apocalyptic: while Lindsey's vision was overtly religious, O'Neill's vision was overtly technological. This difference, however, was a matter of constituency and means. Lindsey's audience was an anxious cadre of Biblical literalists that looked to supernatural intervention for a coming ascension; O'Neill's audience was an anxious cadre of technophiles that sought to craft the ascension from the tools of the moment. In the 70s, their parallel promises of heaven would, combined, garner immense public support in the American populace. In the 80s, the election of Ronald Reagan to the Presidency would supply both dreams with a common champion, and forever dash any hopes that the colonization of space could ever be disassociated from the weapons of apocalypse that were the only known manner to make it possible.

# COLONIZING HEAVEN

## 8: O'Neill's Plan: 1969-1974

The early 1970s cancellation of the last few Apollo moon missions resulted in an ignominious end to what was hoped by those in NASA to be a mere prelude to human conquest of the solar system. The United States experiment with manned spaceflight was faltering. NASA's budget received draconian cuts, and the heady utopian atmosphere of the early years of the Space Age had given way to a glum morning-after reality-check. The real reason behind the moon missions had nothing to do with public excitement over a dawning Space Age, and everything to do with the military and psychological posturing of the Cold War. Those that initially found themselves swept up in the excitement of the Space Age now began to see the space program less as future promise, than government-sponsored theatre.

Into this dismal twilight stepped Princeton physics professor Gerard O'Neill. A native of New York City, O'Neill served in the Navy as a radar technician during World War II, graduated from Swarthmore College Phi Beta Kappa in 1950, and went on to earn a Ph.D. in physics from Cornell University in 1954. A phenom in the world of academic physics, O'Neill planned the construction of the world's first high energy electron storage ring – a revolutionary technology in the world of particle physics. In 1965, O'Neill built this device, and was promptly rewarded with a full professorship at Princeton University. Although an academic physicist, O'Neill had always maintained a strong interest in spaceflight. In 1967, O'Neill was named one of 40 finalists for a NASA program designed to train scientists for the Apollo moon missions; the program was cancelled

before he could fly.[302] Although he was not accepted into the program, he would use his NASA access to advantage in the 1970s. Like the rocketeers before him, O'Neill's extraterrestrial yearnings were not whimsical fantasy, hatched in dreams and left to muse over during times free from academic physics. O'Neill himself truly yearned to live in space, and it is this passion for freedom from the Earth which is one of the defining characteristics of the extraterrestrial millennialist mentality. In 1977, in an interview with Dan Rather on *60 Minutes*, the 53-year old O'Neill admitted that he expected to fly in space during his lifetime.[303]

In the fall of 1969, O'Neill found himself teaching Physics 103, the introductory physics course at Princeton. Although it was the same year that the application of Newtonian physics had enabled humanity to set foot on the moon, O'Neill recognized that the public opinion of the physical sciences was quite low. He would later call 1969 "the peak time of disenchantment with anything in science and engineering" and noticed that many of his brightest students were suffering from a pronounced inferiority complex. "The students who were good at science, and particularly the students who were good at engineering," O'Neill noticed, "felt very defensive about it, because all of their friends and roommates were saying they weren't doing anything relevant." O'Neill saw it as his mission to show his students, as he later claimed, that "despite the bad times, improvements in the human condition could be reached by using science and engineering in the right ways, as opposed to the wrong ways."[304]

So O'Neill decided to teach a concurrent seminar for the swiftest, and possibly most alienated, students in his survey course. His mission had lofty and ambitious goals:

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[302] Michaud, pp. 59-60.

[303] *60 Minutes*. October 9, 1977. "Space Colonization." WTOP-TV, CBS Network, Washington, DC. As transcribed by *Radio-TV Reports, Inc*. in NASA Archives.

[304] "Is the surface of a planet really the right place for an expanding technological civilization? Interviewing Gerard O'Neill." in *Space Colonies*, Stewart Brand, ed. New York: Penguin Books, 1977.

he told them he "would try to find examples of problems to look at which could be of interest in their lifetimes, and which would be challenging on a large scale, and potentially very beneficial to the rest of humanity." But when his students showed up for the seminar, O'Neill's first question had already been determined. The focus of the entire seminar would be a single question: "Is the surface of a planet really the right place for an expanding technological civilization?"[305]

O'Neill had always been interested in space travel, but his high energy physics work seemed far removed from astronautical application. In O'Neill's elite Princeton physics seminar, he began to explore a grandiose and awe-inspiring plan, capable, in his opinion, of forever changing life on earth for the better. It was in the seminar that he discovered the first inklings of a grand plan to ferry humanity off of the Earth.

O'Neill's initial question to his students presupposed a particular answer, namely that the surface of a planet was *not* the "right" place for an "expanding technological civilization." O'Neill's question itself was inspired by the lessons of the first Apollo missions to the moon – missions which had broadcast to a global television audience the utter desolation, inhospitability, and airlessness of the lunar surface. As Apollo 8 astronaut Frank Borman said, as he traveled in his capsule back towards the blue Earth, the moon did not "look like a very exciting place to live or work." O'Neill's implied rejection of planetary surfaces as a colonization locale incorporated Borman's and the space program's insights. The other planets, as O'Neill pointed out later, were "fairly unpleasant in terms of where they're located… They're the wrong distance from the sun, and they've got the wrong rotation times, and the wrong gravities…"[306] O'Neill's solution was to colonize space not by taking off and landing on gravity-heavy planets, but

[305] "Is the surface of a planet really the right place for an expanding technological civilization? Interviewing Gerard O'Neill." in *Space Colonies*, pp. 22-30.
[306] Is the surface of a planet really the right place for an expanding technological civilization? Interviewing Gerard O'Neill." in *Space Colonies*, pp. 22-30.

to manufacture inside-out mini-planets and live on the inner surface. Furthermore, colonies in free space offered superabundant solar energy in quantities impossible to extract on a planet plagued by the inconvenient phenomena of day and night.

But O'Neill's primary concern was never with the economic or social benefits of space colonies, but with the *aesthetic* benefits. He recognized that the photographs of Earth from space, set against the dreary and cramped conditions of the Apollo space capsules, had shifted the American consciousness concerning space-based living. The Earth was expansive and organic, compared to the soul-killing quarters of NASA's metal and plastic space-based submarines. Von Braun's lily-white, antiseptic, and machine-laden space stations and spaceships, perhaps powered by nuclear reactors, were, by the 1970s, part of a future long since discarded as undesirable and even repulsive.

One of O'Neill's first questions, then, involved how to make the space colonies appeal to the very generation which he hoped would inhabit them. O'Neill made it clear that his colonies were a break from the space colonization schemes of the past: "...I had no desire to go the route of just inventing a big spaceship or something that would be a space station," said O'Neill in an interview. "That had no interest for me at all."

> This was to be something that was to be potentially beneficial for a lot of people. It had to look an awful lot like the Earth. So, one of the questions I worried about quite a bit was how to provide earth-normal gravity, and a normal atmosphere, and a normal appearance of the sun as well...[307]

From the very beginning, O'Neill sought to simulate the experience of living on Earth. Previous proposals for space-based living had assumed that, just as workers learned to toil in factories and in mines, future extraterrestrial humans would adapt to the circumstances of their off-Earth environment. The early twentieth century scientist and futurist J.D. Bernal imagined that humans would one day hollow out asteroids and

[307]"'Is the surface of a planet really the right place for an expanding technological civilization?': Interviewing Gerard O'Neill," in *Space Colonies*, pp. 22-30.

construct interior planets on the inside. In addressing critics who claimed that such an existence would be too much unlike that of Earth for human survival and propagation, Bernal dismissed them by responding: “This criticism is valid on the initial assumption that men have not in any way changed…we must anticipate the later chapters and assume men's interests and occupations to have altered.” As evidence, Bernal pointed to the contemporary lives of the devoted scientist who had already turned to a life of Gnostic separation from the rest of his species: "Already the scientist is more immersed in his work and concentrates more on relations with his colleagues than in the immediate life of his neighborhood,” he wrote. Imagining a Baconian New Atlantis in space for Bernal was not difficult, and even blissfully escapist. The experience of being separate from the organic Earth did not trouble Bernal either, who wrote from the perspective of a committed modernist. He anticipated an easy transition from the contemporary worship of the machine and of the manmade, to the experience of life inside a hollowed-out, barren, extraterrestrial stone. “Present æsthetic tendencies verge towards the abstract,” he observed, “and do not demand so much inspiration from untouched nature.” Those who did not wish to live off of the Earth, in such an ‘abstract’ aesthetic and cultural reality, could remain behind on an abandoned planet. “[F]or those whose primary interest is in primitive nature there will always remain the earth which, free from the economic necessity of producing vast quantities of agricultural products, could be allowed to revert to a very much more natural state.”[308]

While Bernal’s pre-WWII optimism concerning the malleability of humanity emerged in an academic climate which accepted the science of eugenics and expected future human societies to breed desirable or adaptable characteristics into subsequent

[308] J.D. Bernal. *The World, the Flesh and the Devil: An Enquiry into the Three Enemies of the Rational Soul*. Bloomington: Indiana University Press, 1969. Second edition.

generations, the notion of a completely inorganic and mechanical existence became an increasingly revolting concept in American culture in the late 60s and early 70s. Instead, the ideas of the iconoclastic designer and inventor Buckminster Fuller enjoyed a vogue in the late 60s among American youth, and this owed much to the popularity and "humanity" of one of his most oft-repeated tenets. Fuller's main approach to world problems consisted of, as one profiler described it, putting "all human efforts into reforming the environment and [cease] trying to reform people."[309] Fuller thought it possible to design utopia through architecture, thus rejecting the personality-oriented efforts of ideological movements such as Communism and Fascism. Combined with Fuller's coining of the term "Spaceship Earth," it seems clear that O'Neill's inside-out Earth vision was inspired by the Fullerism of the time. Fuller's most enduring contribution to 1960s and 1970s architecture would be the geodesic dome – itself a hemispherical structure which became synonymous with futurism and spaceflight.

Large-scale space colonization was also suggested by Konstantin Tsiolkovsky, to whom O'Neill attributed many of his later elaborations about extraterrestrial habitation in zero gravity. Arthur C. Clarke's 1954 novel *Islands in the Sky* described many of the conditions under which space colonists would live, and in 1963, Dandridge M. Cole suggested that future humanity could hollow out enormous asteroids and use the material to construct cylindrical space colonies that closely resembled O'Neill's.[310] Krafft Ehricke, in his 1971 manifesto, "The Extraterrestrial Imperative," suggested the creation of mobile space cities, which he dubbed "androcells," and in 1973, the Lockheed corporation financed the design of a "space city."[311]

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[309]Harold Taylor. "Inside Buckminster Fuller's Universe," in *Saturday Review*. May 2, 1970. p. 57.
[310] Dandridge M. Cole and Donald W. Cox. *Islands in Space: The Challenge of the Planetoids*. Philadelphia: Chilton, 1964.
[311] Michaud, pp. 64-65.

O’Neill anticipated the abandonment of Earth for what he believed to be the utopian benefits of space-based life but the lessons learned from the public’s growing disdain for Apollo caused him to doubt that the aesthetics of “primitive nature” could ever be left totally behind. It was for this reason that O’Neill did not envision his colonies as being completely concealed from the light of the sun and the view of the infinite, but as being composed of a complex series of pivotable mirrors and shutters, all working together to assure that the colonists did not become too homesick for Earth. O’Neill recognized the planetary separation anxiety which several of the astronauts had experienced and did not see how space colonization could be made palatable to an already space-weary public without a believable simulacrum of terrestrial life.

Space colonies were not a new concept. What separated O'Neill's colonies from previous incarnations was their rejection of the anti-natural modernism of Bernal, Clarke and von Braun. O’Neill set out to create an explicitly *postmodern* vision of life in space. Although mankind would live inside enormous machines, in a region with no air, such life, O’Neill accepted, would be impossible if the inhabitants lived completely in the reality of the abstraction to which they had emigrated. The Newtonian perfection of outer space was, prior to the space race, the ultimate backdrop for the abstract modernist utopia. A region completely open to man, without the difficulties of planetary life, and ready to be populated with the ultimate fruits of the Machine Age – space up until the 1950s was a modernist fantasy. O'Neill attempted to transcend the anti-natural modernism of the Machine Age to create a simulacrum of the Earth within the Machine.

With the photographs of Earth from outer space – photographs which critics have noted were attained during exactly that period which corresponds to the commonly

agreed transition from modernism to postmodernism[312] – Bernal's vision of a Baconian space-based utopia turned cold and brutish, and its flowery expectations of adaption to the contingencies of the airless void quickly withered on the vine.

O'Neill mused over the lessons learned during the seminar and for the next four years discussed the concept repeatedly with friends, family, and colleagues. After being encouraged to write an article about his idea by friends, he began to query well-regarded scientific journals such as *Scientific American* and *Science*, but both journals refused publication. *Physics Today* eventually agreed to publish his paper, and the article first appeared in print in September 1974 under the title "The colonization of space."

However, by the fall of 1974 O'Neill's idea had exploded onto the public scene via a less academic route. At the same time that he was attempting to get his initial article published, O'Neill was lecturing on the idea, accompanied by primitive graphics. He was also contacting foundations for the possible funding of a conference. After being rejected by ten different foundations, he finally secured a small $600 grant from the POINT Foundation, an organization endowed via proceeds from the sale of the *Whole Earth Catalog*. The heyday of the *Catalog* had long since passed, and the funding stream from sales of the catalog was nearly exhausted. The POINT Foundation mandated, as a condition of the grant, that it be sent through Princeton University. As a result of directing the grant through the university bureaucracy, Princeton generated a press release advertising the conference, and as a result of this press release, several reporters, including *The New York Times'* resident correspondent on space issues, Walter Sullivan, and 150 other people attended.

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[312] See Denis Cosgrove, "Contested Global Visions: *One-World, Whole-Earth*, and the Apollo Space Photographs," in *Annals of the Association of American Geographers*, 84(2) 1994.

A week later, the *Times* featured Sullivan's article concerning the conference on the front page, under the headline "Proposal for Human Colonies in Space is Hailed by Scientists as Feasible Now." The article featured a primitive diagram detailing the proposed site of the colony at the fifth Lagrange point ("L5"), one of five locations in space where the earth and moon's gravities and orbital motions would interact so as to make stationary an object or objects placed there. Sullivan's piece was matter of fact and free of sarcasm in its description of O'Neill's proposed design and claimed benefits. Nowhere in the 1000-word article was there a single note of skepticism concerning the feasibility of the colony's design or ability to support life. The only cautionary comment came from physicist Freeman Dyson, who worried offhandedly (and prophetically) that such an ambitious project stood little chance of being funded in the contemporary budget climate.[313]

O'Neill was an obscure and talented Ivy League physicist no longer. Interview offers poured in from all over the world, spurred on solely by the *Times* initial front-page piece. O'Neill found himself a bit overwhelmed and flattered by the flood of interest – interest which he realized had been stoked by a mere conference with nary a published paper or article to support any of the *Times*' assertions. The media immediately appeared obsessed with the idea. Later, O'Neill singled out two major reasons for the rapid and unexpected popularity of his plan: a) a sense of freedom, or the hope that space colonies could free mankind and the individual from the increasingly claustrophobic and pessimistic atmosphere on Earth, and b) a sense of participation, or the hope that the thrill of space exploration could be made more democratic, less elitist, and more open.[314]

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[313] Walter Sullivan. "Proposal for Human Colonies in Space is Hailed by Scientists as Feasible Now," in *New York Times*, May 13, 1974. p.1; 23.
[314] *High Frontier,* p. 295.

A lengthy story by Associated Press reporter Howard Benedict in the summer of 1974 contributed to the growing interest in O'Neill's space colony proposal, as did an opinion piece O'Neill penned for the *Los Angeles Times* which was subsequently syndicated in newspapers throughout the country.[315] In September 1974 the popular scientific monthly *Physics Today* gave O'Neill's plan the imprimatur of legitimacy by finally publishing the paper he had been shopping around since 1970. O'Neill admitted in his book *The High Frontier* that he had submitted his paper to that particular journal because "an old friend from graduate school days," Harold T. Davis, was the editor.[316] While Walter Sullivan's *New York Times* article created a firestorm of press interest, the *Physics Today* piece opened O'Neill's plan up to scientific scrutiny.

O'Neill's article in *Physics Today* bore the straightforward title of "The Colonization of Space" and was accompanied by a rather understated and yet revolutionary statement: "Careful engineering and cost analysis shows we can build pleasant, self-sufficient dwelling places in space within the next two decades, solving many of Earth's problems." The first paragraph defined the technological and social revolution O'Neill sought to bring about. "New ideas are controversial when they challenge orthodoxy," O'Neill admitted in his opening. "But orthodoxy changes with time, often surprisingly fast."

> It is orthodox, for example, to believe that Earth is the only practical habitat for Man, and that the human race is close to its ultimate size limits. But I believe we have now reached the point where we can, if we so choose, build new habitats far more comfortable, productive and attractive than is most of the Earth.[317]

In the first paragraph, O'Neill laid his cards on the table: the new life in space would not only solve the imminent population crisis, it would be an extraterrestrial life

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315 *Space Colonies*, p. 25.
316 *High Frontier*, p. 290.
317 Gerard K. O'Neill. "The colonization of space," in *Physics Today*. September 1974.

more “comfortable” and “attractive” than that able to be experienced by most on Earth. O’Neill, in what amounted to a social manifesto published in the pages of a popular science magazine, claimed that the time to move into space had come and that he would be happy to lead the way.

In order to effect this extraterrestrial revolution O’Neill realized that the outer space experience of the Apollo program needed to be reformed, reimagined, and revised. Space travel on television was largely dull. The quiet journey of men through a soundless, airless, lifeless region, all inside a cramped machine the size of a station wagon, en route to the underwhelming and barren surface of the moon had made outer space seem a lot less exciting than space pundits and science fiction writers of the Sputnik-era had made it out to be. Rocket launches might have been spectacular and thrilling, but living in space was an entirely other matter. Without a reformation in the public thinking regarding outer space, O’Neill realized that public funds would never be made available. He believed that the key to making space colonization economically feasible in the short term was to treat space not as a empty but as the possible site of future human culture. Space, O’Neill was crying, was not empty; it could be filled with life, if only the public will existed. O’Neill fervently believed that outer space contained all the resources necessary for the survival and proliferation of extraterrestrial man. The “high men” of O’Neill’s vision could survive without the Mother Earth.

O’Neill’s strategy in this initial article was to light a fire inside the public gut. Instead of taking a gradualist approach to his scheme, O’Neill made the decision to discuss the largest, most ambitious space colonies in his article first – a “fourth generation” space colony he dubbed Model 4. By showing readers that the most pie-in-the-sky space colony proposals could be built with only the available technologies on

hand, O'Neill hoped to prove that his proposal was not science fiction but just merely unrealized technological fact.

So O'Neill pulled no punches in his initial article. He proposed the creation of a 16-mile long and 4-mile in diameter pair of alternately rotating cylinders, capable of housing several million people. He estimated that such a structure could be completed by 2008. Eventually, O'Neill foresaw the possibility of a population of four billion people living within an extraterrestrial zone of 29,000 kilometers across in colonies spaced at 200 kilometer intervals. Such colonies would orbit the fourth and fifth Lagrange points ("L4" and "L5"). The entire population of Earth in 1974 could live in a collection of metal tubes if only the public will would fall in line.

The surface of the cylinders would be divided into six alternating sections of equal area: three window sections and three sections containing the "valleys" or colonial living areas.[318] The windows would allow light reflected from enormous aluminum foil planar mirrors to bathe the living areas in sunlight. The mirrors could be adjusted to vary the angle at which sunlight struck the valleys below. Solar power stations were affixed to the cylinder end cap, able to supply 36,000 megawatts of energy; O'Neill estimated that his colonists would need only 12,000 megawatts.[319]

O'Neill's placed his cylinders in pairs. He initially believed that a single cylinder would serve as an adequate space colony, but he soon discovered that it was difficult to keep a solo cylindrical colony rotating and at the same time keep it oriented towards the sun. So he proposed doubling the cylinders, and having them connected by a tension cable and compression tower.[320]

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[318] See Appendix H.
[319] "The colonization of space," pp. 34-35.
[320] See Appendix G.

After quickly dispensing with the exterior architecture of the colonies in twelve short paragraphs, O'Neill moved on to the larger dream: winning the hearts and minds of the post-Apollo generation. "The key statements so far," he claimed, "have been based on known facts, on calculations that can be checked and on technology whose costs can be estimated realistically." These were now over, and the real dreaming could begin: "The discussion, however, would be sterile without some speculations…" he teased.[321]

With that, O'Neill launched into the crux of his extraterrestrial manifesto. "With an abundance of food and clean electrical energy, controlled climates and temperate weather," he wrote, "living conditions in the colonies should be much more pleasant than in most places on Earth." Off-earth, for O'Neill, meant no cars; a 20-mile long cylinder could easily be traversed via bicycle or golf cart. Movement from one paired cylinder to another, away from the prison of gravity, would mean small, engineless, and pilotless vehicles of little expense could float dreamily betwixt. These ultimate eco-vehicles – no Earth to pollute, no pollution needed to power – would resemble Winnebagos: "The 'recreational vehicles' of the colonial age," wrote O'Neill, "are… likely to be simple spacecraft, consisting of well furnished pressure shells with little complexity beyond an oxygen supply and with much the same arrangement of kitchen facilities and living space as are found today in our traveling homes."[322]

Transportation within and without, then, would be idyllic, sustainable, and clean. O'Neill then turned to the recreational and social aspects of space colony life – a subject he would return to again and again over the next few years, and the clearest glimpse into the utopian wishes of the Princeton physicist and those who later followed him. Sports in the space colony would diversify. Because the dual colonies could replicate hemispheric

[321] "The colonization of space," p. 36.
[322] "The colonization of space," p. 36.

differences on Earth, one cylinder could be in midwinter while the other was in midsummer. This would enable an easy trip from the ski slopes to the sailboat, a journey of northern California proportions (O'Neill's adopted home). Gliding and soaring – both passions of O'Neill's – would be easy and effortless. Scuba diving would be possible in "a special, slowly rotating agricultural cylinder with water and fish."[323]

The proliferation of extraterrestrial recreational possibilities would be accompanied by a proliferation of political and sociological possibilities. O'Neill estimated that individual colonies could become large communes and self-governing entities. "A community of 200,000 people," he believed, "eager to preserve its own culture and language, can even choose to remain largely isolated." The countries of the Earth could retain their national and cultural identity even in space. Groups smaller than national entities could also expand: "Free, diverse social experimentation could thrive in such a protected, self-sufficient environment."[324] William Bradford's Pilgrims would supposedly love the possibilities for this New Eden, a very high "citye on a hill."

Despite the possible retention of national identity in space, O'Neill believed that the ultimate utopian dream could perhaps be fulfilled: the end of warfare. O'Neill coquettishly feigned reluctance in suggesting such a goal – "I hesitate somewhat to claim for space colonization the ability to solve one other problem, one of the most agonizing of all: the pain and destruction caused by territorial wars." But he went on to suggest such a possibility anyway, thus claiming his colonies were the technological fix for human belligerence the weary post-Vietnam War generation had been waiting for. In O'Neill's view, a perspective influenced by Robert Ardrey's 1966 animal behavior bestseller, *The Territorial Imperative*, the thirty years since the end of World War II had taught

[323] "The colonization of space," p. 36.
[324] "The colonization of space," p. 36.

humanity that warfare was “strongly, although not wholly, motivated by territorial conflicts: battles over limited, nonextendable pieces of land.” Without land scarcity, according to O’Neill, war would be unnecessary. Nuclear weapons and power plants would be left behind on Earth since “the colonies can obtain all the energy they could ever need from clean solar power.”[325] No spent fuel rods would float about in the void, fodder for terrorists or despots. Space would be clean and sustainable while the Earth, at the bottom of a dried-up gravity well, would be the unfortunate dumping ground for man’s worst technological failures.

Along with the end of human warfare and the boundless colonization of the universe, O’Neill foresaw the solution of five intransigent global problems "without recourse to repression."

> Bringing every human being up to a living standard now enjoyed only by the most fortunate; protecting the biosphere from damage caused by transportation and industrial pollution; finding high-quality living space for a world population that is doubling every 35 years; finding clean, practical energy sources; preventing overload of Earth’s heat balance.[326]

As for population growth, O’Neill estimated that even if human population continued at its present growth rate – both in the hypothetical colonies as well as on Earth, thus estimating a 20,000-fold increase in 500 years – space colonies would be forever able to absorb such growth. O’Neill claimed that by 2050 his colonies could “reverse the rise in Earth’s population” and that thirty years later, the population “could be reduced from a peak of 16.5 billion people to whatever stable value is desired.” O’Neill felt the optimal conditions for human existence on Earth would be in the neighborhood of 1.2 billion, a figure corresponding to a nostalgic 1910 global census, and he suggested that this be the aimed-for figure. Soon after, space colony population

[325] “The colonization of space,” p. 36.
[326] “The colonization of space,” p. 36.

density would abate to "1.43 people per hectare," as more and more colonies came on line.[327] In the end, according to O'Neill, the Earth would be depopulated and unthreatened by man, humanity would probably be free from warfare, free expression and self-government would be enjoyed by all, energy would be abundant, inexpensive, and clean, and most of humanity would be living comfortably.

Yet for the rest of the article O'Neill reverted to the more practical goal of the near-term construction of a smaller space habitat consisting of 2000 construction workers, 10,000 residents, and a mass of only 500,000 tons. Anything less than this Model 1 colony, claimed O'Neill, "would be little more than a renamed space station, perhaps able to maintain itself but incapable of building the larger models that are necessary if the program is ultimately to support itself." The glorious utopia O'Neill envisioned by 2050 could not be possible without the initial colonies. Once the initial colonies became self-sufficient, the construction of the subsequent colonies would be much easier since materials would no longer have to be lifted off the Earth but could be mined and manufactured from lunar and asteroidal material. O'Neill's initial dizzying vision of a space colony of several million people was part of a long-range project, and, as he mandated, "it is an essential feature of the colonization project that Earth should no longer have to support it after the first two or three stages."[328]

O'Neill's first published extrapolation of the space colony idea appeared in a relatively low-circulation physics magazine. It was clearly not the usual place for a manifesto of epochal significance. Yet O'Neill's strategy was to refrain from publicly stumping for his idea until he could have a halfway legitimate scientific publication publish his dream. Otherwise, O'Neill sagely feared that his idea would be branded a

[327] "The colonization of space," p. 37.
[328] "The colonization of space," p. 38.

fanciful form of science fiction with little basis in reality. O'Neill made the most of the article by outlining the bedrock characteristics of the idea that would remain largely unchanged for the next five years: space colonization was easy, necessary, and the only true solution to terrestrial problems; space colonization would enable humans to live longer, healthier, and more fulfilling lives and preserve the survival of the human race; and space colonization was fun.

The *Physics Today* article elicited a flurry of letters to the editor, many of them questioning O'Neill's assumptions and calculations, especially concerning his boldest assertion, that the population increase of Earth could be stemmed, and even reversed, by a fast track space colony construction program. For the first time, O'Neill's idea faced significant outside criticism, and the problems raised with the physicist's plan were as sharp and incisive as O'Neill's initial proposals were optimistic and vague. One reader observed that in order to reduce the world population from 16.5 billion to 1.2 billion within thirty years, 970 people/minute would have to be removed from the planet, or the equivalent of two "jumbo jets" of people removed each minute, all day, every day. Another reader calculated that just to maintain the current global population "the world would have to launch over 60,000 Apollo spaceships per day… These feats are certainly not feasible by the 1980's, if ever…" "[T]he logistics of 'The Great Exodus'," observed Alan P. Biddle, "would tax the Earth's waning resources to nearly the same magnitude as the actual construction of the colonies." Furthermore, Biddle concluded, the only way to maintain such a rate of population reduction would be through "forced deportation." [329]

Another reader offered a similarly sober and philosophical criticism: perhaps Man was not meant to colonize space at all. Bruce Harteneck's letter reflected the perspective on ecological harmony and anti-technology which had emerged in the dawn of the Earth

[329] Alan P. Biddle, Letter to the Editor, *Physics Today*, September 1975. p. 14-15.

Age – a perspective O'Neill and other countercultural visionaries saw as a dangerous impediment to the forward motion of human progress. "The solution to overpopulation and pollution does not lie in trying to flee our world and build new worlds out of metal and glass," claimed the San Jose, California resident. "The only true solution lies in accepting the natural limitations of our environment and in attempting to live in harmony with nature, rather than trying to conquer and exploit it."[330]

O'Neill admitted months later that at least some of the letters sent to him possessed valid criticisms concerning his calculations, although he did not specify which ones. Of all the criticisms, O'Neill claimed that there were two that were "carefully worked out, in the sense of someone at least sitting down and trying to work out some numbers." He considered these letters "very helpful in forcing me to go into detail and justify on a numerical basis things which I hadn't taken the time to calculate, because I just had had a sort of hunch that the numbers would work out all right."[331] In other words, O'Neill admitted that he was operating from a hunch -- the assumption that space colonies were desirable, inevitable, and unquestionable from both a societal, financial, and evolutionary standpoint. This was, on its face, an inherently faith-based perspective.

The media attention received by O'Neill's plan piqued the interest of officials at NASA. Since the end of the Apollo missions the various initiatives launched by the agency such as the Mars Viking program, Skylab, the Apollo-Soyuz transnational linkup, and the nascent plans for a reusable orbiter which would eventually become the space shuttle failed to stimulate public interest. Most of these programs paled in comparison to the stunning moon landings of Apollo and the public was even a bit bored with moon

[330] Bruce Harteneck, Letter to the Editor, *Physics Today*, September 1975. p. 15.
[331] "Is the surface…" in *Space Colonies*, p. 26.

landings.[332] For many in NASA and especially for those officials for whom the spacefaring dream was the impetus for their involvement in spaceflight (and not military, technological, or other reasons), O'Neill's plan was the bold, forward-thinking, imaginative initiative they had been searching for.

By late 1974, NASA officials recognized that O'Neill's space colonization plan possessed many attractive features. For one, it had already received adulatory press coverage and the public seemed interested. Few criticisms had arisen and certainly nothing on the scale of the public cynicism which had greeted the last few moon missions. Secondly, O'Neill's plan possessed a large "wow" factor. The spacious interiors of his enormous spheres dispelled the claustrophobic atmosphere which hung over previous imaginations of space-based life. The absence of gravity and recreation options in space made people think about the space environment and actually imagine what it would be like to live there. The very fact that his colonies would be freed from the dead moon and an apparently dead Mars made the idea seem, at least in the beginning, to be a grand solution. O'Neill's idea briefly filled the large hole left by the decline of the awe-inspiring Apollo missions. Even if they weren't ever going to be built, his colonies made people think about a future and destiny for humanity in space. Such publicity could not help but be good for the struggling space agency.

At the same time, the interest in O'Neill's plan was also the product of desperation. Where else could the space vision migrate if not the moon and Mars? Free space seemed the only place left. NASA Director of Long Range Planning, Jesco von Puttkamer, recalled later that after meeting O'Neill and hearing about his idea, he immediately thought, "This is just what I am looking for."[333] Administrator Fletcher was

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[332] David E. Nye, "Don't Fly Us to the Moon: The American Public and the Apollo Program," in *Foundation*. No. 66. Spring 1996.

[333] Quoted in Michael A.G. Michaud. *Reaching for the High Frontier: The American Pro-Space Movement, 1972-84*New York: Praeger, 1986. p. 65.

an immediate convert, and endorsed the idea in public the same month O'Neill's *Physics Today* article appeared. Fletcher told the press that O'Neill's colonies could provide a "reasonable safeguard" for humanity in the case of environmental disaster or nuclear conflict. "I'm not predicting the Earth will become uninhabitable," he quickly added. Fletcher felt confident that the plan could be implemented as soon as the 1980s, "although it wouldn't necessarily have to be that soon." O'Neill's cost estimates, he claimed, were "a bit optimistic but are not far off."[334] In a November 1975 address at the National Academy of Engineering, Fletcher told the attendees that if NASA did not look forward and fund plans such as O'Neill's, and thus give guidance to a now-oriented American public, "our race" would "squander its potential and continue our unchecked momentum down the slopes of time towards the shore of the primeval sea to join the great reptiles and nature's other unsuccessful experiments." He ended by quoting H.G. Wells: "The choice is the universe or nothing."[335] The director of NASA's Ames Research Center outside San Francisco, Hans Mark, also became an early supporter of the plan. In 1976, NASA Associate Administrator for Manned Spaceflight John Yardley claimed that placing 10,000 colonists on the moon or in one of O'Neill's colonies would be a "cinch."[336]

During a visit to the Goddard Space Center in Washington to meet with NASA officials O'Neill received a small lesson in financial practicality. Von Puttkamer suggested to O'Neill that he have the colonies pay for themselves by linking their construction to the development of a solar power satellite system such as that suggested

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[334] Quoted in Henry W. Pierce. "NASA Chief Predicts People Space Colonies," in *Pittsburg Post-Gazette*. September 28, 1974. p. 1.
[335] James C. Fletcher, Address to the National Academy of Engineering, November 10, 1975. Reprinted in part in *L-5 News*, No. 4, December 1975. p. 2. Online at http://www.l5news.org/L5news/L5news7512.pdf.
[336] *L-5 News*, No. 6, February, 1976. p. 1 Online at http://www.l5news.org/L5news/L5news7602.pdf.

by Dr. Peter Glaser in 1968.[337] The Solar Power Satellite system was to consist of a series of geosynchronous satellites fitted with massive solar energy collectors. The satellites would gather the energy of the sun and beam it to earth via an antenna. In order to catch this energy, beamed to Earth in the form of microwaves, vast swaths of the Earth's surface would be cleared to erect systems of energy collectors. These collectors would, in turn, funnel the energy to homes and businesses the world over.

With the energy crisis in full swing solar power had by 1974 become the imagined panacea for energy supply problems. Certainly such a belief was and still is extremely compelling. The sun provides a source of abundant, constant, and powerful energy to the Earth. Contrasted with the finite and dwindling supplies of subterranean oil and the political strife the battle over such reserves has engendered, solar power seems to promise a sustainable and prosperous future for mankind if only this energy can be effectively harnessed and distributed. The Solar Power Satellite System (SPSS) seemed to promise both industry and environmentalists a manner by which solar energy could be collected, harnessed, and sold.

While O'Neill had suggested in his 1974 conference and *Physics Today* paper that solar power would provide ample energy for the energy and construction needs of his space colonies, he did not mention the concept of a solar power satellite system. While O'Neill was initially skeptical about the feasibility of Glaser's plan, he came to see solar power satellites as a worthy component to his grander space colony vision.[338] What the solar power satellite concept offered his colonization scheme was an "Earth-beneficial" technology. Instead of just imagining space colonies as self-contained, independent, and in a sense, selfish entities, the solar power satellite idea helped justify O'Neill's colonies

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[337] Peter Glaser, "Power from the Sun, Its Future," in *Science*. Vol 162, No 3856, November 1968. pp 857-861.
[338] O'Neill, *The High Frontier*, pp.299-300.

by promising direct and immediate benefits to Earth. With solar power the darling energy of the counterculture, O'Neill's plan seemed to offer a further bridge between NASA and the disaffected youth who had "turned off" to the space program of the 1960s. At the same time, O'Neill could now justify space colonies as a parallel program to the solar power satellite concept – a concept which NASA higher-ups saw as potentially more profitable than O'Neill's idea. O'Neill, in essence, began to see the solar power satellite concept as the 'bootstrap' his space colonization scheme needed. The romantic, and yet perhaps practical vision of a two-pronged approach to space colonization – from solar power satellite construction to the massive human habitation of space – also appealed to many NASA officials including Administrator James Fletcher, who also encouraged the linkage. The idea promised NASA visionaries the rapture of planetary escape coupled with the promise of forever solving the global turmoil over energy resources. Despite serious concerns over the feasibility of the plan, and the danger of beaming high-intensity microwaves at the Earth, the solar power satellite idea became the primary justification for the space agency to explore O'Neill's colonization scheme. If successful the system promised achievements of utopian proportions. And NASA would be the prime benefactor.

After meeting with NASA officials in Washington O'Neill was able to convince the head of the agency's advanced programs, Captain Robert Freitag, to provide a small initial grant to fund the idea and further flesh it out. This grant was small, only $25,000, and lasted for only six months.[339] While NASA's funding for O'Neill's plan would never be high, the backing of the space agency opened many doors to the physicist and allowed his idea to progress beyond the speculative stage previous space colonization proposals had never left. In the next few years, O'Neill would receive prominent public

[339] Michaud, p. 65.

endorsements from former NASA Administrator Thomas Paine and in one of the rocketeer's last public statements, Wernher von Braun.[340] Interest from politicians would reach its apogee when Arizona Congressman Morris Udall, then a serious contender for the Democratic nomination for President in 1976, expressed interest in the idea and dispatched a letter praising the plan to former NASA Deputy Administrator Robert Seamans, then head of the Energy Research and Development Administration (ERDA).[341] Udall expressed particular interest in the solar power satellite facet of the plan and requested in his letter that Seamans do all he could to help secure $1 million for fiscal year 1976 to fund research into the SPSS system.[342]

At the same time O'Neill's plan became the major rallying point of a nascent 1970s "pro-space" movement. One historian called O'Neill's *Physics Today* article "one of the most photocopied science articles in history."[343] An entire industry of extraterrestrial dreamers, space colonization advocates, missile defense supporters, NASA officials, and technophiles became, nearly overnight, committed pundits for the O'Neill vision of a supposedly eco-friendly ascension off of the Earth.

An organization called the L-5 Society became the most visible and powerful stumpers for the O'Neill vision. Founded in 1975 by Arizona entrepreneurs Carolyn and Keith Henson, the Society became the main public interest organization backing O'Neill's idea and attracted many disillusioned young people of the post-60s generation including many who had never been interested in space or NASA previously. Carolyn Henson helped bring Morris Udall and O'Neill together in the first place, resulting in Udall's

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340 Thomas O. Paine. "Humanity Unlimited," *Newsweek*, August 25, 1975. p. 11.
341 Michaud, p. 85.
342 Morris K. Udall to Robert C. Seamans, Letter, July 30, 1975. Reprinted in *L-5 News*, Number 1, September 1975. Online at http://www.l5news.org/L5news/L5news7509.pdf.
343 Michael A.G. Michaud. *Reaching for the High Frontier: The American Pro-Space Movement, 1972-84* p. 65.

initial statement of public interest in space colonization.[344] Originally cautious about direct lobbying on behalf of the idea given their tax-exempt status, changes to the tax code in 1977 allowed the Society to devote 20 percent of their income toward political action. While the Society received an initial impetus from O'Neill when he provided the Hensons with his mailing list of interested citizens, the physicist began to disassociate himself from the group by 1976 for fear that many of the "space groupies" in the organization could damage his reputation in NASA and on Capitol Hill. However, O'Neill's closest and oldest assistant, K. Eric Drexler, would continue to be a committed L-5 activist into the 1980s.[345] Many of the early members of the L-5 Society would go on to positions in the private and public sector aerospace field, while others, like Drexler, would turn their interest to high technologies supportive of space industrialization, such as nanotechnology.[346]

While O'Neill's plan was attracting the attention of space-minded private citizens, the physicist was preparing a comprehensive NASA-funded Summer Study of space colonization at NASA's Ames Research Center outside San Francisco. In an interview that July, O'Neill downplayed the importance of the Ames study which he characterized more as an educational exercise for young physics faculty and "not for aerospace professionals by any means." Many of the faculty arrived at the project, according to O'Neill, "knowing next to nothing about the whole subject."[347] O'Neill must have already been feeling as if NASA was shelving his idea and not actually planning on constructing space colonies within the next five years.

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[344] David Brandt-Eichsen, "The L-5 Society," *Ad Astra,* November-December 1994. Online at http://www.l5news.org/L5history.htm.
[345] Michaud, p. 95.
[346] Eric Drexler. *Engines of Creation*. New York: Doubleday, 1986. Drexler is one of the world's foremost experts on the benefits and drawbacks of nanotechnology.
[347] "Is the surface of a planet really the right place for an expanding technological civilization? Interviewing Gerard O'Neill." in *Space Colonies*, pp. 22-30.

In July 1975 the physicist appeared before the House of Representatives Subcommittee on Space Science and Applications and outlined his vision of space colonization. In his appearance O'Neill included a lengthy discussion of solar power satellites and shrewdly worked to justify space colony expenditures in terms of the rewards of solving the energy crisis once and for all. Energy in space and on space colonies, claimed O'Neill, would be "energy without guilt." By the 13th year after the implementation of a solar power satellite construction program, O'Neill predicted that the energy produced this way could "fill the entire market for new generator capacity in the U.S." Such an energy source would also put the Mideast out of business: "If these numbers are correct," testified O'Neill, "the market value of Middle Eastern oil could drop irreversibly before the end of this century."[348]

Eventually, O'Neill foresaw an abundance of energy from this route, so much so, in fact, that he predicted a complete reversal of Third World resentment at American consumptive habits. "With a program of power plant construction at L5," O'Neill told the committee, "we could return, at little cost in energy and materials from the earth, to our traditional role as a generous donor of wealth to those in need." Such a "return," felt O'Neill would be received as extremely generous, "yet with little cost to our own national resources." Solar power satellites, which O'Neill has been skeptical about the year before, now promised the creation of a perpetual motion machine of planetary goodwill.

O'Neill went on to predict vast horizons for his nascent space colony movement. "Space colonization," believed the physicist, "may become a phenomenon as least as powerful as the environmental movement." To back up his assertion, he told the

[348] "Space Colonization and Energy Supply to the Earth," Testimony of Dr. Gerard K. O'Neill before the Sub-Committee on Space Science and Applications of the Committee on Science and Technology, United States House of Representatives, July 23, 1975. Reprinted in *Space Colonies*, p. 18.

Congressional subcommittee that of the letters he received responding to his idea, "more than 99% are favorable" and "less than 1% of all mail is in any way irrational." The letters he received, testified O'Neill, expressed several specific reasons why the concept was so exciting in comparison to "all the other space options now extant." First, it was a "right-now possibility," a bold and daring project realizable "within the immediate future." Second, O'Neill claimed that his respondents were captivated by the egalitarian aspect of the idea in that it offered ordinary men and women the chance to live and work in space. This stood in sharp contrast to the perceived elitism of an Apollo program staffed by fighter pilots and the occasional geologist. Third, O'Neill told the committee that unlike other large-scale technical options such as the supersonic transport, nuclear energy, or strip-mining, space colonies were a technology that offered "the possibility of satisfying real needs while preserving rather than further burdening the environment." Finally, O'Neill appealed to the patriotic aspect of space colonies by hinting that the announcement of a massive space colonization project during the Bicentennial celebrations might prove highly inspiring. "It is seen as opening a new frontier, challenging the best that is in us in terms of technical ability, personal motivation and the desire for human freedom." O'Neill told the committee. "Many correspondents refer to space colonization by analogy to the discovery of the New World or to the settlement a century ago of the American frontier."[349]

The following year, O'Neill published his fullest extrapolation of the utopian benefits of space colonization: his book *The High Frontier*. His book remains today a must-read among space colony enthusiasts and on its strength O'Neill became the unquestioned popular expert on space colonization. However, by the time *The High Frontier* appeared on bookshelves, his plan had begun to receive significant criticism

[349] "Space Colonization and Energy Supply to the Earth," Reprinted in *Space Colonies,* p. 19.

within political and technological circles. The backlash against O'Neill was two-pronged, simultaneously questioning the feasibility of the plan, the credentials of the physicist, and the motives behind NASA's support. The cascade of doubt brought O'Neill's plan back to Earth.

In the next few chapters, we will explore the reasons behind the collapse of O'Neill's plan but with an eye toward understanding the exo-millennial roots of the space colonization fantasy. It is only by seeing how O'Neill's scheme resembled previous Christian incarnations of heaven that we can recognize the physicist's misguided faith in his wildly off-base figures, as well as the impassioned response with which his plan was greeted by NASA officials.

# 9: SPACE COLONIES: A CASE STUDY IN EXTRATERRESTRIAL MILLENNIALISM

The frontier myth is a powerful organizing force in American culture, but the frontier myth has no meaning outside of the ideological and religious roots which call for the conquest of the frontier. Manifest Destiny was, at its heart, a Christian enterprise, an attempt to remake the world in a holy unity under the banner of American Christian idealism. To disconnect Manifest Destiny from its religious roots is to make it merely the hunger for power, but the inner turbine – the dynamo – within Manifest Destiny was Christianity, and an American messianic Christianity of compelling ideological power. While Gerard O'Neill characterized his colonies as an extension of the American frontier, their true inspiration came from Biblical, and specifically New Testament, Scripture.

Space colonies, in the vision of O'Neill and others, represent the ultimate utopia of the extraterrestrial millennialist fantasy. O'Neill's colonies in particular promise a heavenly techno-Garden of Eden and are the logical extraterrestrial millennialist completion of the unfinished drama begun with Adam and Eve. In returning to an Eden in the sky, the colonies promise the union of God's heavenly domain with God's lost and perfect Earthly paradise. In offering a democratic ascension off of the Earth, the space colonies become the ultimate Christian rapture wish in which the chosen – the hardy, spacebound pioneers – escape the doomed Earth before its demise. And in ascending into heaven, the space colonists help to immortalize the human race in a massive imitation of Christ's solo flight to deathlessness.

My major preoccupation in this dissertation has been the comparison of the dream of rocket-powered spaceflight and the dream of the Christian Rapture, and I have asserted that not only do they arise from the same roots, but that they possess parallel tendencies

towards apocalypticism, pessimism, and ecological ignorance. Analyzing O'Neill's colonies as a bold manifestation of a largely opaque and loose ideology of extraterrestrial millennialism tells us much about how little Western civilization has separated itself from the faith-based prejudices of apocalyptic Christianity. O'Neill was an ideologist extraordinaire, a preacher of space exodus who advocated for his extraterrestrial cause as fervently as William Miller or Joseph Smith before him. Only O'Neill did not use the Bible as his blueprint, despite the fact that his colonies bear the unmistakeable imprint of the Christian mythos. O'Neill advocated for a distinctively American "Rapture" with the use of the rockets of the apocalypse. If von Braun was the high priest of extraterrestrial millennialism who created both the instruments of his flock's fear and the instrument to release them from the fear, then O'Neill was the revival minister, asking the flock to lift their eyes to the sky and imagine the heavenly city of transcendence which would replace the unpredictable terror of living on the exposed surface of a doomed planet.

O'Neill's techno-Heavens show us not only how embedded the Christian millennial outlook is within our space program, but also how embedded such an outlook is within nearly every strata of American society, and in particular in the technological realms. The Calvinist God still rules the cosmos above the American skies and he is still trying to remind his Puritan inheritance that his will is terrible, life is short and brutish, and all on Earth most likely deserve the pain of eternal punishment. And he exhorts his people to follow him off of the Earth, far across the cosmos, to the very edge of time, and to abandon the Earth to those unwilling or unable to accept the message of Christ.

An analysis of O'Neill's colonies reveals the deep analogies between extraterrestrial millennialism and its older and explicitly Christian progenitor. This section of the dissertation will examine O'Neill's colonies by isolating each aspect of the Christian prophetic mythos and identifying the corresponding technological analogues

within the space colony proposal themselves. For insight into O'Neill's brand of extraterrestrial millennialism, I have taken examples largely from his two colonization manifestoes, *The High Frontier* (1976) and *2081: A Hopeful View of Our Human Future* (1981). Written the same year that *Time* magazine called the "year of the evangelical," O'Neill's *High Frontier* remains today the boldest call for space colonization published in the last half century. O'Neill structured the book so that each chapter took the reader narratively and conceptually further and further from the Earth and closer and closer to a completely space-based existence. In following O'Neill's trajectory, ever further from the Earth, we should remember we are also following the supposed flight of the soul through the medieval Christian cosmos, to the edge of the Empyrean Realm. Throughout the book, O'Neill attempts to create non-fiction out of science fiction; technological materiality out of mystical spirituality. Whether or not O'Neill recognized the parallels between his idea and the Christian rapture myth is unclear, but the imprint of its psychological and narrative influence is clear throughout.

His follow-up volume, *2081*, is less about space colonization than about life on Earth post-colonization. Between the two books, O'Neill revealed his disenchantment with the Earth and his utopian expectations of a life in the sky. In the following chapters, I have compared O'Neill's space colonization vision with both the directly Christian-inspired visions of his extraterrestrialist rocketeer predecessors and pre-spaceflight rapture literature. I have chosen several key elements of the rapture myth for analysis. Cotton Mather's imagined flight of the risen elect, in my reading, becomes the root of the Space Age preoccupation with the supposed health and recreational benefits of weightlessness. The predicted tribulation to accompany the days immediately preceding Christ's return becomes, in O'Neill's writings, the establishment of a global police surveillance state for which outer space is the only escape. The colonies themselves, in a

similar fashion, become the prophesied heavenly city or cities to which the elect ascend – spaces filled with the divine light of God. The split between the elect and the damned predicted to accompany the end of days occurs within the aging counterculture that O'Neill lobbies to support his idea. And finally, the dream of populating outer space with endlessly self-reproducing colonies of metal and glass becomes part of a grand and sinister vision to built a permanent manmade wall around an abandoned garden Earth, thus fulfilling the Revelation prophecy of St. John and shutting humanity off from the Genesis-challenging mysteries of the infinite cosmos.

When O'Neill's space colonization plans are compared to their earlier overtly religious space colonization schemes and also against apocalyptic prophecy and Christian End-Times literature, it is clear that O'Neill's plan emerges from the same Christian, Newtonian-apocalyptic, exo-milllennial roots as the plans of the earliest rocketeers.

## The O'Neillian Rapture and the Divinity of Weightlessness

What separated O'Neill's space colonization proposal from others hatched during the era of the moon missions was its rejection of what Isaac Asimov coined as "planetary chauvinism."[350] According to O'Neill, humans possessed a natural prejudice against imagining extraterrestrial human colonization on anything other than a planetary body such as the moon or Mars. O'Neill calculated that the "gravity well" of Earth and other planetary bodies and the effort and energy expended to "escape" from these gravity wells would be unnecessary in "free space" where earth-gravity would exert little influence. By claiming that humanity and NASA were imaginatively hobbled by a form of planetary chauvinism, O'Neill deflected attention from the fact that most of the utopian reverie surrounding space exploration and colonization on the part of rocketeers and spaceflight enthusiasts centered on the experience of *weightlessness*.

For O'Neill, planetary chauvinism had blinded Space Age thinkers from the true extraterrestrial calling of mankind which was the nearly boundless expanses of free space. As in the Christian rapture myth, O'Neill disdained the ground and the gravity which bound humanity to it. The gravity well of Earth was a "hole" from which mankind must escape. "Does it make sense to climb with great effort out of one such hole," asked O'Neill, "drift across a region rich in energy and materials, and then laboriously climb back down again into another hole…?"[351] For O'Neill, the attraction of space colonization was both socially and economically meaningless without freedom from gravity.

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[350] *High Frontier*, p. 35.
[351] *High Frontier*, p. 37.

The characterization of the weightlessness of spaceflight as "divine" in some universal manner appeared in many guises throughout O'Neill's writings on space colonization. This assumed aspect of divinity was translated by O'Neill into both human and mechanical forms. O'Neill spent a great deal of space in his books explaining how the effect of weightlessness on the individual would be an experience of physical pleasure and ecstasy and even made the claim that the weightless state was a healthy one capable of prolonging life and ameliorating personal suffering. In the mechanical sense, O'Neill valorized weightlessness as beneficial for society as a whole because machines, he assumed, free of the complications of gravity would be more efficient in outer space and thus able to produce abundance for both the earthbound and spacebound humanity of the near future. This valorization of weightlessness, often proclaimed contrary to a growing body of physiological knowledge chronicling the detrimental effects of earthlessness on human bone structure and health, has, as we have seen, a long history stretching back to the writings of Tsiolkovsky, and is grounded in an ancient assumption of celestial perfection embedded in the drama of the Christian rapture and in the superhuman characteristics of angels.

## SPACEFLIGHT AND THE RAPTURE OF MEN

For O'Neill, a weightless humanity would be at root a happy and almost perfect humanity. O'Neill's promise that the human race would save itself and thus make itself symbolically immortal by emigrating into outer space was perhaps the boldest and inspiring justification for colonization. The deliverance of the human race from was O'Neill's ultimate fantasy of salvation. Such a deliverance could not come except through a release from gravity.

Konstantin Tsiolkovsky, from whom O'Neill derived many of his ideas for the recreational and technical possibilites of zero-gravity life, believed that humanity could very well become immortal merely through the experience of migrating to an planet-less environment. Many of Tsiolkovsky's beliefs were couched in the form of science fiction narratives. These narratives, like O'Neill's fictional epistolaries, were long on discussions of technical problems and often absent of plot. Tsiolkovsky repeatedly stressed the health benefits of living off of the Earth, frequently mentioning, as he did in his 1920 book *Outside the Earth*, that in such an environment "the arms and legs will never grow numb,"[352] but more fervently in his 1885 science fiction treatise *Dreams of Earth and Sky*. In this book, Tsiolkovsky imagined contact with a race of immortal extraterrestrials living on an asteroid. They explained to him the secret to their longevity. "But how do you account for such longevity, almost immortality?" Tsiolkovsky asked the "natives" of the asteroid. "Why should we not live long?" they indignantly answered

> We owe our longevity to the cleanliness of our bodies which carry no infectious agents – all the cocci, bacilli and fungi which teem in your wretched bodies and produce a constant threat of destruction; we owe our longevity to the complete isolation of our bodies from harmful elements, thanks to the absolute vacuum that surrounds us and the impermeability of our skin; we owe our longevity to the wonderful structure of our bodies possessing organs of which you, inhabitants of Earth, have no idea whatever.[353]

The immortality of Tsiolkovsky's somewhat arrogant extraterrestrials was the assumed state to which an off-Earth humanity would evolve. In other writings, Tsiolkovsky intimated that not only was gravity unhealthy, but that it threatened all life on Earth with extinction. In a chapter in *Dreams of Earth and Sky* entitled "The Gravity Hater," Tsiolkovsky staged a conversation between himself and "a very odd fellow" who

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[352] Konstantin Tsiolkovsky, "Outside the Earth," in *The Science Fiction of Konstantin Tsiolkovsky*. Adam Starchild, ed. Seattle: University Press of the Pacific, 1979. p. 267.
[353] Konstantin Tsiolkovsky, "Dreams of Earth and Sky," in *The Science Fiction of Konstantin Tsiolkovsky*. Adam Starchild, ed. Seattle: University Press of the Pacific, 1979. pp. 103-104.

"hated terrestrial gravity as if it were something living… as his personal, bitterest enemy." The Gravity Hater is actually Tsiolkovsky and the conversation is between the Russian schoolteacher and a personality-less questioner. The Gravity Hater, when questioned about the lack of atmosphere on the asteroids he believes are the perfect habitation for humanity, replies indignantly, "[W]hy do you think that creatures cannot live without visible breathing? Why shouldn't people be able to adapt themselves to such a life in the course of time?" Besides, the Gravity Hater, retorts, the atmosphere would someday "be absorbed by the Earth's crust" and life on Earth would "have to be content with less and less oxygen anyway."[354] While the "Gravity Hater" was referring to a chemical process and not the physical property of gravity, Tsiolkovsky's enchantment with the idea of the Earth absorbing the sky meshed well with his consistent disdain for the heaviness of living on a gravitational body.

In his writings between 1969 and 1976, O'Neill claimed similar medical benefits for the space colonist. In testimony before the House of Representatives Sub-committee on Space Science and Applications O'Neill left no room for doubt that the exodus of humanity into space would be a healthy one, increasing individual longevity. In a colony where "weight would almost disappear," O'Neill testified that "[i]t seems almost a certainty" that "a person with a serious heart condition could live far longer than on earth, and that low gravity could greatly ease many of the health problems of advancing age."[355] However, O'Neill made his bold Congressional prediction at a most inopportune time. That same year the first American-authored studies of long duration spaceflight were published, chronicling the health effects of microgravity on human physiology during

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[354] Konstantin Tsiolkovsky. "Dreams of Earth and Sky," pp. 80-82.

[355] Gerard K. O'Neill, "Space Colonization and Energy Supply to the Earth: Testimony of Dr. Gerard K. O'Neill Before the Sub-Committee on Space Science and Applications of the Committee on Science and Technology, United States House of Representatives, July 23, 1975," reprinted in *Space Colonies*, Stewart Brand, ed. New York: Penguin, 1977. p. 14.

three Skylab missions conducted between 1973 and 1974. The results were not encouraging. After an initial serious bout of motion sickness the astronauts, who stayed in space for periods of 28, 59, and 84 days, experienced a significant reduction in their red blood cell count. While the red blood cell count seemed to level off and rise again during the longest mission, the loss of bone calcium did not, and the astronauts steadily lost an average of .5 percent of their calcium per month.[356] No amount of exercise helped stem this alarming loss of bone density. Even with the desultory Skylab evidence already in and despite the fact that his own 1975 Summer Study had come to very negative conclusions concerning life without gravity, he continued to trumpet a Tsiolkovskian faith in the health benefits of zero gravity in his book *The High Frontier*. "Here on Earth, with age and the infirmities of age, the body must spend more and more of its reserves of energy in simply fighting gravity," he wrote. "[T]hose who would be confined to bed on Earth could have freedom of movement in a region of near-zero gravity." O'Neill imagined old age homes in space filled with the formerly immobile and crippled elderly, with all the inhabitants floating about as if in heaven. Because of this, and without any further evidence, O'Neill stated "[I]t seems quite possible that people in a space habitat will live to a greater age than they would on Earth."[357] Any medical problems that would result from such a life O'Neill repeatedly dismissed since, like von Braun and NASA officials before him, he felt such medical problems could be avoided by rotating his space colony to simulate Earth conditions. O'Neill endeavored to have his vision both ways: he designed his colonies so that they could provide both gravitationally free zones and simulated gravity at the same time.

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[356] T.A. Heppenheimer, *Colonies in Space*. Harrisburg: Stackpole, 1977. pp. 112-13; also see Richard S. Johnston and Lawrence F. Dietlin, eds. *Biomedical Results from Skylab*. Washington, D.C.: NASA, 1977.
[357] *High Frontier,* pp. 258-59.

In the absence of positive medical evidence from the Skylab program, O'Neill heightened his rhetoric concerning the recreational benefits of weightlessness, portraying such activities as beneficial to spiritual and mental health. He devoted a great deal of text to the possibility of weightless recreation as a diversion from the simulacrum of terrestrial weight. O'Neill's descriptions of recreation were filled with inimations of a healthy and pleasurable life of self-willed flight and buoyancy. Climbing manmade space colony mountains would create the effect of lessened weight the higher up a hiker ascended, scuba diving in manmade tanks would be free of the dangers of depressurization, swimmers would move "as naturally and freely as the fish," and surfing on waves that "break as slowly as in a dream" would be a transcendent reality.[358] Healthy living also included naughty sex in "one-tenth gravity" floating hotels. One of O'Neill's ribald hypothetical aging colonists writes back to her daughter on Earth that the bedrooms in these hotels are "indescribable" and "designed for just one thing." The colonist, Jennie, "can't imagine" her daughter and son-in-law "not getting along well together" but she advises that "if they ever have a problem, before it gets too serious bring him up here for a second honeymoon! You may never want to go back."[359] Performance art would enrich the audience far beyond that on Earth because the "easiness and lightness and the whole dreamlike quality of ballet is just so much better without gravity pulling down every motion," claimed Jennie. Commuting to jobs in cities and zero-gravity industries would be healthy and easy and far more comfortable and quick than that experienced by "Earth's tired millions of workaday travelers."[360] O'Neill also suggested a hierarchy of pay depending on the adaptability of a person to commuting in zero-g in an odd extraterrestrial echo of the doctrine of Calvinist heavenly election

[358] *High Frontier,* p. 95.
[359] *High Frontier,* p. 214.
[360] *High Frontier,* p. 90.

through visible trappings of wealth. "Those who can adapt to rapid change qualify for higher-paying jobs," states one of O'Neill's colonists in a letter back home.[361]

However, O'Neill's most rapturous musings concerning the possibilities of recreational weightlessness lay in the self-willed flight offered by pedal-powered gliders. Tracing the dream of such effortless flight back to the imagination of classical Greece and Leonardo da Vinci, and ignoring the thousands of pages of religious speculation concerning the Christian rapture, O'Neill claimed that in his colonies "human-powered flight" would be "easy for everyone, not just athletes." Such movement would be healthy and invigorating for all. O'Neill imagined "elderly ladies and gentlemen taking their evening constitutionals by gently pedaling their aircraft, while viewing the world miles below them."[362]

O'Neill, like Bernal and Tsiolkovsky, also imagined the gradual evolution of humanity into a form more accepting of the rigors of zero-g. "Our descendants," he claims, "raised from birth with zero-gravity lives will be far more inventive than we are…" and the colony will be so designed so that in the beginning "variations" from "Earth conditions" will be limited "until we gain experience on physiological tolerances."[363]

O'Neill was careful to cover all his bases, however, and he mentioned the recent Skylab studies in a short paragraph. O'Neill noted that these studies documented a "loss of blood volume, degeneration of certain bones, loss of bone marrow, and a slackening of muscle tone" in low gravity conditions. O'Neill admitted that "the advisability of exposing people to zero-gravity for many months without change seems doubtful" and

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[361] *High Frontier,* p. 6; see Max Weber, *The Protestant Ethic and the Spirit of Capitalism*. New York: Scribner's, 1930.
[362] *High Frontier,* p. 96. Also see p. 212 for a colonist's perspective on the recreation.
[363] *High Frontier,* pp. 84; 120.

warned that exposure to gravity upon return from space could kill astronauts with heart conditions. He claimed that he did "not want to make emigration into space a one-way trip, without the option of return at will." But immediately after making this statement, O'Neill noted that "physiologists have found that bed rest" simulated zero-gravity, so that "it is not necessary to be subjected to one gravity all the time…" and that besides, the colony would be rotated, providing more than enough simulated gravity in certain colonial locales for health maintenance.[364]

However, even before O'Neill's book went to press, doubts about the rigor of the physicist's architectural analysis had exploded in the space enthusiast community itself. These doubts called into question the ability of the scheme to provide alternating zero-gravity and Earth-normal gravity conditions. Since conceiving of the idea in 1969, O'Neill had focused almost all of his energy on imagining the creation of what he dubbed the "Bernal Sphere." Such a sphere would invert reality, so that colonists would live *within* a simulacrum of the Earth. Instead of living on the outside surface of a sphere, extraterrestrial humanity would live on the interior. The Bernal Sphere was not only O'Neill's brainchild; practically all of his rhetoric about existence in a free-floating space colony was predicated upon this one design. As the physicist's own doubts began to creep in about the feasibility of such a structure, he began to propose a cylindrical shape for even the larger colonies, although without ever completely abandoning the spherical idea.

However, the 1975 NASA-funded Summer Study of the physicist's idea immediately ran into a significant problem with both the sphere and cylinder. In July, one of the participants in the study, Lawrence Winkler, an undergraduate at the Massachusetts Institute of Technology, pointed out that O'Neill's assumption that the

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[364] *High Frontier,* pp. 46-47.

Sphere could be rotated at a rate of three revolutions per minute (3 rpm) in order to produce Earth-normal gravity was not supported by available research into the adaptability of humans to such an environment. Apparently, O'Neill had completely failed to take into account the Coriolis effect.[365]

On Earth, the dominant experience of gravity is the sensation of weight. However, in 1835, the French engineer and mathematician Gustave-Gaspard Coriolis proved that on a rotating body such as the Earth another effect exerted a force on all objects upon that body. This force is most often demonstrating by using the example of a cannonball or missile fired from a fixed location. While on a flat grid system without any atmospheric disturbance such an object would be expected to travel on a straight path. However, the Earth is spherical and rotating. As such, a cannonball fired in a northerly or southerly direction will not travel on the path intended, but will instead deflect to the east, with the degree of deflection determined by the speed of rotation of the Earth, the direction in which the cannonball was fired, and the distance covered by the cannonball. The Coriolis effect exerts a variable effect on objects traveling longitudinally, or in a north-south or south-north direction, and no effect on objects traveling due east or west. This is because the Earth rotates in a counterclockwise direction: this is why the sun seems to rise in the east, seems to travel westward across the sky, and seems to set on the western horizon. The rotation of the Earth deflects objects intended to travel in a particular direction more or less to the east. Such an effect is vital to the accuracy of twentieth century ballistic missiles, because it must be taken into account so that the missile reaches its intended target. The Coriolis effect also account for the movement of many of the wind patterns on Earth.

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[365] Heppenheimer, *Colonies in Space*. pp. 113-15.

Winkler informed the Summer Study soon after its inception that the Coriolis effect, when experienced within a body rotating at three revolutions per minute, could create profoundly disconcerting and troubling effects. Even in a colony rotating at one revolution per minute, a hypothetical colonist would have to overcome an initial motion sickness to successfully adapt to life in such an interior Earth. But at three revolutions per minute, a leap of 21 inches from the interior surface of the sphere or cylinder would result in the colonist landing more than 2 inches from his or her initial jumping-off point. In an extraterrestrial colony rotating several times per minute, the simplest of motions become complex and even terrifying. Due to the effect, normal vision would be greatly hampered so that if one turns their head even slightly, stationary objects would appear to gyrate and continue to do so even after the colonist living under such conditions stops looking around. Motion sickness would become endemic and almost impossible to control. Balance sensors within the inner ear, affected only infinitesimally by the Coriolis effect on Earth, would go haywire in a colony rotating three times a minute.[366]

At the time of Winkler's almost laughably basic revelation, the high energy physicist had already made plans to testify before Congress about his vision. NASA had already funded the O'Neill-directed Summer Study to the tune of over one hundred thousand dollars. Winkler, and other members of the study came to an inescapable and chilling conclusion. No available evidence existed to prove that the colony of O'Neill's imagination could ever be built, and that the only supportable colony of large size could rotate at no more than one revolution per minute (1 rpm) to achieve a balance between Earth-normal gravity and the disorienting perceptual and physiological effects of any rotation.

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[366] R.D. Johnson and C. Holbrow, eds. *Space Settlements: A Design Study*. SP-413. Washington, D.C.: NASA, 1977. Online at: http://lifesci3.arc.nasa.gov/SpaceSettlement/75SummerStudy/Design.html.

O'Neill, understandably, was not pleased with the news. His notes and graphics were all set for him to appear and provide testimony before the Legislative branch of the United States government. O'Neill, a physicist, recognized immediately the problem, so he tried to compromise with Winkler. "Couldn't we do it at two rpm?" he asked the MIT undergraduate. Winkler was noncommittal, and O'Neill appeared before the Congressional Subcommittee.[367]

O'Neill told the subcommittee, headed by Arizona Congressman and 1976 Democratic Presidential candidate Morris Udall, that "[p]hysiology experiments in rotating rooms on earth indicate that humans can acclimatize to quite high rotation rates, some to as much as one rotation every six seconds," or 10 rpm. However, O'Neill conceded in his testimony that traveling between proposed zero-gravity work areas and the interior of a sphere or cylinder spinning like a top could create "inner-ear disturbances." As a result, he testified that the rotations per minute needed to be kept low, but claimed, in a seeming rebuttal of Winkler's lesson in basic physics, "[i]t is quite possible that our lack of information is forcing us toward unnecessary conservatism on this point." O'Neill suggested, somewhat self-servingly, that more extraterrestrial experiments were necessary because experiments on earth could "never be more than approximate."

Then O'Neill inserted a quick and recent revision to the architectural scheme he had been enamored of since 1969, prompted by the Summer Study's recent revelations. "Conservatism" on the subject of rotational rates, he claimed, had led the Study "to a new and possibly more attractive alternative design." This design, which he called "toroidal," referring to a torus, or doughnut, was actually, in the words of space colony expert T.A. Heppenheimer, a "rather stubby cylinder." O'Neill's revised design, hatched on the spur

[367] Heppenheimer, *Colonies in Space*. p. 115.

of the moment in reaction to the Coriolis revelation, was only shaped like a torus in that the zero-gravity agricultural areas surrounding the central living space would ring the colony as if it were Saturn. The actual design was not toroidal but still cylindrical. And the design was more complicated than those previously proposed. The agricultural torus, O'Neill testified, would rotate at a completely different rate and in a completely different direction as the central living cylinder. He christened this design the "Sunflower" and supplied the subcommittee with two diagrams.[368]

One of the diagrams supplied by O'Neill to Congress depicted the Sunflower as being approximately 500 meters, or approximately 1500 feet in radius. The Sunflower's living habitat of O'Neill's design resembled a geometric compromise between the Bernal sphere and the cylinder he had previously conceived. Indeed, T.A. Heppenheimer reported that O'Neill, when confronted by Winkler, initially "thought of reviving an old idea, the 'Bernal Sphere.'" Heppenheimer maintained that O'Neill's Sunflower was a hastily prepared compromise based on Winkler's confrontation.[369] It would never have worked, and O'Neill's testimony before Congress was largely improvised.

As a result of his maintenance of the spherical idea, O'Neill could still testify to the gathered Representatives about the recreational and health benefits of living inside an interior spherical object complete with an Earthlike environment, ideas which had stoked the public interest which had resulted in his being funded by a Fletcher administrated NASA in the first place. But after quickly describing the popular sensation of living within the sphere – "[i]t allows for natural sunshine, a hillside terraced environment, considerable bodies of water for swimming and boating, and an overall population

[368] See *Space Colonies*, p. 17.
[369] Heppenheimer, *Colonies in Space*, pp. 115-18.

density characteristic of some quite attractive modern communities in the U.S. and in southern France"[370] – O'Neill, in his next paragraph, either erred, or lied, in his testimony.

It was "startling to realize" he testified, "that even the first-model space community could have a population of 10,000 people and that its circumference could be more than one mile." This was a curious statement because the circumference of the colony was not so much the issue. All previous measurements of the colonies, in miles, were concerned with the *length* of the colony. O'Neill's original estimation for a colony of 10,000 inhabitants would have a diameter of 600 feet, or a circumference of about 1/3 mile, provide one Earth gravity at three rotations per minute, and be one mile long.[371] In his haste to prepare a believable and accurate testimony before Congress, O'Neill substituted a circumference measurement for a length measurement, thus making his colonies seem as large as previously touted.

In any case, upon his return to the Summer Study Winkler was "outraged" that O'Neill's testimony not only disdained the recent revelations as "possible… unnecessary conservatism," but that the colony design O'Neill proposed would not actually have the low gravity he trumpeted as curing heart disease and prolonging life and that these effects would be, in fact, impossible. Just a few days later, several Summer Study participants gathered in a small Bay Area apartment and completely abandoned O'Neill's spherical low-gravity vision in favor of a Earth-normal gravity doughnut space colony – a torus which resembled a very large von Braunian space station and looked not at all like the interior Earths O'Neill had sold to the American people over the last year.[372]

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[370] In talking of "communities in the U.S. and in southern France," O'Neill appears to be referring to the Summer Study's torus design, with its mall-like interior, with extremely dense apartment housing, and not his original vision of a larger sphere or cylinder.

[371] Heppenheimer, *Colonies in Space*, p. 114.

[372] Heppenheimer, *Colonies in Space*, p. 118. Heppenheimer, who chronicled this dispute in his book, and who came close to declaring outright that O'Neill had misled the American people in sworn testimony before Congress, would, in the coming years, become estranged from the physicist and his followers. This was perhaps also prompted by the fact that Heppenheimer's book was published the same year as O'Neill's

But O'Neill had too much invested in his space colony vision to abandon his dreams of healthful microgravity living inside a big metal sphere and he didn't let the findings of a group of engineers at the NASA Summer Study get in the way. *The High Frontier* continued to tout both zero-gravity life and his plans for cylinders and the Bernal Sphere even after the NASA-funded study found them impractical, enormously expensive, and well nigh impossible. O'Neill was devoted to the gravity-less utopia previously propagated by Tsiolkovsky.

## THE RAPTURE OF THE MACHINES

O'Neill would replace the utopian exo-millennialism of gravity-less human perfection with a more defensible industrial vision of the supposed benefits of low gravity. The notion that machines, with their many working parts, are somehow "destined" for space, or will work better in space than on Earth, has a long history. All the rocketeers believed this and stated this as an essential reason for the conquest of space. There is a definite logic to this notion. Machinery and industry are the products of engineering and engineering is a discipline concerned with applying the abstract laws of physics to construct objects. Newtonian physics explains many phenomena on Earth but the effect of the Earth's atmosphere on the movement of objects and the effect of gravity makes all Earth-based engineering somewhat inexact. The realm beyond the Earth, however, imagined since ancient Greece as an abstract, perfect, and even holy realm, supposedly contains few of these complications. Heaven and its successor, outer space, are the ultimate abstractions. Newtonian physics may work decently on Earth, but in

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*The High Frontier*, and incorporated, with ample attribution, many of the physicist's ideas. Heppenheimer's book is generally considered to be a more practical and readable treatise on the subject than O'Neill's. See Michael Michaud, *Reaching for the High Frontier: The Pro-Space Movement, 1972-84*. New York: Praeger, 1986.; p. 82.; Jib Fowles, "The High Frontier," Book review in *Technology and Culture*, October 1977, Vol. 18, No. 4. pp. 718-720.

space, such physics works much better. Newton was, after all, primarily an astronomer, and his laws have been assumed by physicists and engineers since his era to work much better off of the Earth than on. As a result of this belief, machines, the product of such physics, have been assumed by many space enthusiasts throughout the modern era to work better in space than on Earth.

Again, Tsiolkovsky became one of the earliest and most fervent popularizers of this idea, using it to justify the exodus of technological humanity off of the planet and into a more perfect, gravityless, and atmosphere-less environment. In nearly every one of his stories and treatises, he marvels at the lightness of a place without Earth-gravity, and how easy and effortless even the most burdensome tasks become. "You can lift heavy loads, leap so high and feel so light not because you are stronger… but because gravity is less…" one of his sagely mock physicist friends tells him on an imaginary journey into space. Similarly, machines with moving parts in an extraterrestrial environment, Tsiolkovsky believed, would approach perfection. In many of his writings, the Russian schoolteacher envisioned the perfection by extraterrestrials of the most dominant machine technology on Earth at the time – the railroad. In space, he imagined that these extraterrestrial trains would be powered by solar energy, freely available in an region without atmosphere. On a populated asteroid, he finds "many-storied perpetual-motion circuit trains driven by solar motors" which can "attain a speed 10 times as fast as that of the fast terrestrial locomotives…" He finds that he can cause these trains to attain great speeds with his own power: "[I]t is enough to create slight friction between the truck and the side of the moving train" and "within a few minutes I am speeding along with it at the rate of 128 km/hr." By building up speed, and by pushing other trains in front, and by climbing from one train to another, Tsiolkovsky finds he can travel between a series of asteroids arranged in a ring at lightning speeds. Elsewhere, he explained how for

machines that required gravity, rotation of the "factory building" could be achieved, but he also touted the benefits of zero gravity for workers who would find it "easy to handle" large industrial parts. "[I]n an environment without gravity," he stated, "a hammer can be as useful as on the Earth… It is easier to impart velocity to objects in a gravity-free environment that it is on the Earth."[373]

As the machines of the twentieth century became more complex, believers in the exo-millennial vision became even more enamored with the possibilities for industry in the space environment. In imagining the proliferation of metallic globes throughout space constructed by highly advanced technological man, J.D. Bernal imagined that zero-gravity would be a boon. "Owing to the absence of gravitation," he stated, the construction of a metallic sphere, "would not be an engineering feat of any magnitude." Such structures could be easily cobbled together from the "substance of one or more smaller asteroids, rings of Saturn, or other planetary detritus." According to Bernal, zero gravity would be a relatively simple environment to adjust to. "This three-dimensional, gravitationless way of living is very difficult for us to imagine," he admitted, "but there is no reason to suppose that we would not ultimately adjust ourselves to it."

> We should be released from the way we are dragged down on the surface of the earth all our lives: the slightest push against a relatively rigid object would send us yards away; a good jump - and we should be spinning across from one side of the globe to the other. Resistance to the air would, of course, come in, as it does on earth; but this could be turned to advantage by the use of short wings. Objects would become endowed with a peculiar levity.

However, it was only as the Space Age dawned that the full promise of zero-gravity machines became elaborated by those who sought their rapture. Arthur C. Clarke, the semi-official prophet of the Age, was one of the earliest philosophers of space to claim that not only would the extraterrestrial environment allow machines to work

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[373] Konstantin Tsiolkovsky, "The Aims of Astronautics," pp. 365-66.

perfectly but that because of such an advantage, machinery might even supercede humanity, making it "obsolescent." In 1963, Clarke predicted in his essay "The Obsolescence of Man," that humanity would eventually "explore and colonize" the universe "but it will be at a cost of tremendous technical efforts, for most of our energies will be devoted to protecting our frail and sensitive bodies against the extremes of temperature, pressure, or gravity found in space and on other worlds." Machines did not suffer from these effects, Clarke claimed. Machines in space, to Clarke, approached their destined perfection. "Within very wide limits, machines are indifferent to these extremes," he wrote. "Even more important, they can wait patiently through the years and the centuries that will be needed for travel to the far reaches of the universe." Both Tsiolkovsky and Bernal had foreseen the difficulty facing humans in the extraterrestrial environment and both went into detail about how humanity would construct metal shells to protect frail flesh and how the detritus and waste of industry would have to be controlled so that it did not harm those humans in the immediate workplace. However, Clarke proposed a simpler, and more sinister, solution. While he claimed that "[c]reatures of flesh and blood… can explore space and win control over infinitesimal fractions of it," he believed that "only creatures of metal and plastic can ever really conquer it, as indeed they have already started to do." For Clarke, machines were the highest product of intelligence, so he stated his belief that "[i]t may well be that only in space, confronted with environments fiercer and more complex than any to be found upon this planet, will intelligence be able to reach its fullest stature." Clarke predicted a split as a result of space travel – a rapturous split between the earthbound, and the spacebound accompanied by machines. "Like other qualities," he stated, "intelligence is developed by struggle and conflict; in the ages to come, the dullards may remain on placid Earth, and real genius will flourish only in space – the realm of the machine, not of

flesh and blood." The spacebound portion of humanity, however, would no longer be fully human. At first the spacebound would be the cyborgs proposed by Manfred Clynes and Nathan Kline: "a body which has machines hitched to it, or built into it, to take over and modify some of its functions." But according to Clarke this "partnership" would not last. The "purely organic component" would "become such a hindrance that it has to be discarded…" Although, Clarke admitted that "most people will find it is a rather bleak prospect for humanity if it ends up a pampered specimen in some biological museum – even if that museum is the whole planet Earth," he boldly declared that "this… is an attitude I find impossible to share." Instead, Clarke paraphrased Nietzsche that "man… is a rope stretched between the animal and the superhuman." In the inheritance of the cosmos by machinery destined to be raptured there, Clarke felt that modern humanity in allowing this to occur will have served a "noble purpose."[374]

In the space colony exo-millennial rapture fantasies of Gerard O'Neill, the "obsolescence of man" by machines was not a stated option. O'Neill claimed to want to humanize space. In remarks before the Senate Subcommittee on Aerospace Technology and National Needs in 1976, O'Neill cited as one of the reasons for the "strong and mainly positive" public response to his plan, "the eventual earthlike character of the new territory being opened" and "the possibility that the new options may involve not a machine-dominated robot-like future, but green grass and trees and flowers."[375] But as his dream of zero-gravity sex hotels, zero-gravity swimming pools, and zero-gravity ballet began to collapse under the weight of engineering reality, his vision of space colonization became increasingly machine-based.

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[374] Arthur C. Clarke. *Profiles of the Future*. New York: Bantam, 1963 (1970). pp. 222-227.
[375] Space Colonies, p. 71.

However, O'Neill's colonies, the first of which he estimated would cost $30.7 billion in 1972 dollars, or more than $2 billion less than the entire Apollo project, were initially given little way of paying for themselves, except through the "manufacture of high strength single crystals in the zerogravity, high-vacuum environment," and this would only be possible with the second stage of colonies. As public, press, and NASA interest in his scheme began to balloon, O'Neill adopted Peter Glaser's solar power satellite idea as an important economic adjunct to the project. O'Neill's adoption of the idea was provoked by increased NASA interest in the project on behalf of the Fletcher Administration.[376] Once the NASA technocracy became involved with O'Neill's visions, extraterrestrial industrialization of various kinds became an integral economic justification for the project.

The Ames 1975 NASA Summer Study gave as one of its primary four design goals the ability to "develop commercial activity sufficient to attract capital and to produce goods and services for trade with Earth." The study reiterated the common Tsiolokovskian notion in space circles that extraterrestrial machines would somehow perform better than their terrestrial counterparts. "Weightlessness is a major potential resource of space, for it means humans can perform tasks impossible on Earth," the study declared. "Large masses do not require support, and their movement is restricted only by inertia. Structures can be designed without provision for support against the forces of gravity; in free space there is no such thing as a static load." The study went on to claim that new forms of industry could occur in space. "Although these opportunities are only beginning to be explored, it seems likely that weightlessness will permit novel industrial

[376] Michaud, p. 66.

processes." The study supplied only two references for this claim, one of which was a testimony before Congress delivered by Peenemunde rocketeer Krafft Ehricke in 1975.[377]

However, the study was also forced to take note of various disadvantages of the extraterrestrial environment which had begun to crop up even in the earliest manned missions outside the atmosphere. The physiological effects on humans in zero gravity, the report stated, while "not well understood," were "not reassuring." The report cited decreased bone mass and density, osteoporosis, bone fractures, hormone imbalances, unstable nutritional states, hypoglycemia, and aberrant increases in secondary hormone levels as some of the effects of medium-term space living. Readaptation to Earth gravity resulted in conditions even less pleasant, including heart abnormalities, muscle reflex changes, venous pooling and leucocytosis. While some of these changes abated in returning astronauts, the study suggested that some of these conditions could, in longer duration missions than those yet accomplished become "irreversible" and thus result in "reduction in the effectiveness of veins..., changes such as a decrease in the effectiveness of the immune system, or the manifestation of differences in fetal development (especially possible inhibitions of the development of the balance mechanism of the inner ear)."[378] Nearly all of the studies cited were conducted before the Skylab missions, although the report, not released until 1977, seems clearly to have been influenced by the discouraging results from those missions. The study also noted that other effects of deep space travel could cause additional difficulties due to the influence of cosmic radiation. Such radiation, in colonies placed permanently in far-Earth space, could create catastrophic damage to the human body.

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[377] R.D. Johnson and C. Holbrow, eds. *Space Settlements: A Design Study*, p. 21; Reference cited in study report was Ehricke, K. A.: Space Industrial Productivity, New Options for the Future, presentation before SubCommittee on Space Science and Applications of the Committee on Science and Technology, U.S. House of Representatives, 94th Congress, Serial M, vol. 2, Sept. 1975.

[378] R.D. Johnson and C. Holbrow, eds. *Space Settlements: A Design Study*, p. 21

The 1975 Summer Study, despite a host of discouraging findings, recommended further study of the idea. Echoing the bold can-do rhetoric of the Kennedy-conceived 1960s space race the report concluded that there were "no insurmountable problems to prevent humans from living in space." Although there were admittedly problems "both many and large" these difficulties could "be solved with technology available now or through future technical advances." This admission was made in the full recognition that O'Neill himself had predicated his entire project on the supposed fact that colonies containing millions of humans could be easily constructed using contemporary technology. "The people of Earth have both the knowledge and resources to colonize space," the report stated. "It is the principal conclusion of the study group that the United States, possibly in cooperation with other nations, should take specific steps toward that goal of space colonization."[379]

Administrator James C. Fletcher penned the 1976 foreword to the study, and whereas in 1974, he had confidently declared that O'Neill's colonies could be built by the 1980s, he seemed a bit more circumspect and cautious two years later. After leading off his short foreword with yet another evocation of the "transoceanic voyages… of the fourteenth and fifteenth centuries," he explained that "settlement in space is not an authorized program, and no man can now say if or when such a dazzling venture may be formally undertaken." He called the report a "mind-stretcher" as powerful as the photographs of Earth from outer space which, he claimed, created the "concept of spacecraft Earth, a sphere of finite resources and ominous pollution…" The preface which followed Fletcher's lackluster but hopeful foreword included an admission that might help explain the attempt by NASA to maintain optimism about the project in the face of so much negative scientific and engineering evidence. The report, the preface

[379] R.D. Johnson and C. Holbrow, eds. *Space Settlements: A Design Study*, p. 182.

stated, was "meant for a readership beyond that of the aerospace community." Perhaps hoping that a layman interested in the idea would ignore the enormous technical obstacles, the report justified this popular orientation "[b]ecause the idea of colonizing space has awakened strong public interest…", and as a result, "the report is written to be understood by the educated public and specialists in other fields."[380]

Despite the implicit pessimistic findings of the report, NASA did not abandon research into space colonization but instead funded yet another Summer Study into O'Neill's idea in 1977. And O'Neill continued to trumpet the perfection and immortality of machines, if not men, in zero-gravity. In *The High Frontier*, he claimed that a space power plant for colonial energy needs would "need less maintenance than its Earthbound counterpart" and that "even though its turbine rotor and generator armature may have a mass of thousands of tons," it would be weightless and thus "can be supported with no frictional contact, on air or magnetic bearings which should have an infinite lifetime."[381] The subsequent 1977 Summer Study was devoted overwhelmingly to the workability of machines in zero gravity, including only three sections out of sixteen concerning keeping humans alive in low gravity. O'Neill participated in the authorship of none of these sections, focusing instead solely on the construction of the "lunar mass driver," a pet project of his which he claimed would make it easy to electromagnetically launch moon-mined ore into enormous "catchers" resembling extraterrestrial butterfly nets which would be stationed strategically about the moon. The sections on habitat design and life support, although couched in optimistic and obfuscatory technical language similar to that found in the 1975 study, reached a host of even more pessimistic conclusions. Not only did the problems of living in low gravity not become any brighter but the report's

[380] R.D. Johnson and C. Holbrow, eds. *Space Settlements: A Design Study*, pp. v-vii.
[381] *High Frontier*, p.54

conclusions regarding the maintenance of a closed, ecologically sustainable system of agriculture and ranching, the prevention of epidemic disease and fires, the probability of toxic chemicals building up in the food chain, the disposal of waste, the utter necessity of cumbersome radiation shielding which would effectively block out most of the natural sunlight, and the abatement of deafening noise within the colonies produced by the never-ending drone of industrial machinery were all open-ended and largely pessimistic.[382] Each finding, however discouraging, only compelled the authors to suggest further study and funding.

O'Neill would never abandon his dream of the necessity of large portions of the human population departing the Earth for the gravity-lessness of outer space. Even as NASA cut off all funding for his space colony research after 1977 and even after run-ins with the space enthusiast community caused him to become almost completely estranged from any established extraterrestrial advocacy group, he never stopped claiming that his dream was simple, necessary, and inevitable. However, in his second book, *2081: A Hopeful View of the Human Future*, O'Neill began to bring elements of his low-gravity obsession down to Earth by devoting large portions of his half-fiction, half-engineering treatise to the description of his next pet-project: the development of massive networks of subterranean high-speed "floater" subways. Such "floaters," suspended above magnetic fields, and "flying through the Earth" through vacuum tunnels, would enable passengers to travel over 200 miles in less than 20 minutes.[383] In the end, O'Neill began to move away from entering the low-gravity of the extraterrestrial cosmos, instead seeking to drill into the Earth and place thousands of miles of tunnels, all as airless and lifeless as space, so that humanity could hurtle through the planet at the speed of a rocket in the void.

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[382] John Billingham and William Gilbreath. *Space Resources and Space Settlements*. NASA SP-428. Washington, D.C.: NASA, 1979. online at http://lifesci3.arc.nasa.gov/SpaceSettlement/spaceres/II-1.html.
[383] Gerard O'Neill. *2081: A Hopeful View of the Human Future*. NewYork: Simon and Schuster, 1981.

The faith in the weightless escape of humanity from the Earth's gravity can be found in both the unshakeable belief of Biblical literalists in the Christian rapture and in the equally unshakeable belief in the desirability of the colonization of space by the rocketeers and those they inspired. What distinguishes modern spaceflight from these more ancient dreams and realities is its birth in an age of Newtonian physics and its birth in a Christian context where the mechanical contrivances of humanity were believed to bring mortals closer to immortality and to God. The belief in the divinity of machines and their ability to set humanity free became a central and largely inseparable facet of the early twentieth century passion for flight which Joseph Corn has called the "winged gospel," and the later twentieth century passion for spaceflight. In the next few sections we will look at other aspects of O'Neill's vision, all birthed from the founders of rocketry and spaceflight who conceived of their theories in a more pervasively Christian context than O'Neill. These aspects provide additional evidence that the space colonization dream evolved directly from, and not convergent to, the Christian impulse towards the above.

## 10: Tribulation on the American Frontiers: Space Colonies and the Doomed Earth

Both Konstantin Tsiolkovsky and Gerard O'Neill attributed their desire for weightlessness to their earliest youth. "[T]he basic drive to reach out for the sun," Tsiolkovsky wrote, "to shed the bonds of gravity, has been with me ever since my infancy… [I]n very early childhood… I longed after such a place unfettered by gravitation."[384] Sociologist William Sims Bainbridge wrote of Tsiolkovsky's writings that they "sometimes express a deep rapture, connected frequently to weightlessness, a sensuousness that suggests the ideas had deep, presocial significance for him." Tsiolkovsky's youthful dream of levity was also shared by Hermann Oberth and Robert Goddard, both of whom also cited this early interest as one of their central motivations to helping in the construction of rockets for the Nazi and American military complexes.[385]

O'Neill, like the rocketeers before him, also attributed his desire to enter outer space to a deeply held, and only partly self-understood, psychological wish to be "free." "My own interest in space," he wrote in *The High Frontier*, "…went back to my own childhood… I have always felt strongly a personal desire to be free of boundaries and

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[384] Cited in William Sims Bainbridge. *The Spaceflight/Revolution: A Sociological Study*. Robert E. Krieger: Malabar, Florida, 1983. p. 21. Also see Tsiolkovsky's essay "The Gravity Hater," in *The Call of the Cosmos*. Moscow, Foreign Languages Publishing House, 1960 for a self-referential look at his passion for terrestrial escape. O'Neill's vision of a weightless world in outer space, as outlined in *The High Frontier*, was greatly influenced by Tsiolokovksy's writings decades earlier. In *The High Frontier*, O'Neill claims that he did not hear about Tsiolkovsky until five years after he began work on the problem (from this, we can calculate no earlier than the fall of 1974, given a genesis date of the fall of 1969) when a colleague gave him English-language translations of the Soviet rocketeer's books. Tsiolkovsky's novel *Beyond the Planet Earth* is identical to the Princeton physicist's account in form. Both authors pen a fictional account of life off of the Earth through the eyes of future historians/colonists, and intersperse this futuristic history with technological calculations. See *The High Frontier*, p. 277, and *Space Colonies* for timeline and claims.

[385] Bainbridge, p. 22.

regimentation."[386] However, O'Neill understood and communicated his childhood vision into a particularly American discourse about freedom. In selling space colonies to a 1970s American public, O'Neill often cited the Club of Rome study, *The Limits to Growth* (1972) as a prime example of a new form of totalitarian regimentation, born of ecological and environmental pessimism about the prospects of humanity on a crowded, overburdened, and increasingly resource-poor Earth. "The steady-state society," O'Neill wrote in *The High Frontier*, "ridden with rules and laws, proposed by the early workers on the limits to growth was, to me, abhorrent."[387] In this way O'Neill cast himself as the Space Age's free-market, libertarian prophet. The liberation of large portions of the Earth's population into space colonies, O'Neill claimed, would make the arguments in *The Limits to Growth* obsolete.

So both Tsiolkovsky and O'Neill conceived of "times of tribulation" which necessitated the desire for weightless rapture. While Tsiolkovsky saw the coming destruction of the Earth through long-term scientific processes such as the cooling of the sun, or through the loss of the Earth's atmosphere, O'Neill conceived of much more imminent threats to the future of life on Earth as part of his pre-rapture tribulation. O'Neill wanted humanity off the planet – now.

The rapture of O'Neill's space colonizers has at its root one primary necessity: the escape from an overburdened planet. The picture of the Earth which O'Neill painted was one in the throes of chaos, a planet deep into a Tribulation reminiscent of Darby's millennial scheme. In *The High Frontier*, O'Neill used one particular 1970s doomsday book as evidence of the unsustainability of continuing life on only Earth. Richard Heilbroner's book *An Inquiry into the Human Prospect* (1974) was one of the most

[386] *High Frontier*, p. 64.
[387] *High Frontier*, p. 279.

learned and pessimistic treatises to emerge from the era of ecological dismay. In his *High Frontier* chapter "The Human Prospect on Earth," O'Neill supported Heilbroner's major assertions that human population would continue to increase, the engine of industrialization would not stop humming and not stop increasing its rate of resource devouring, no new set of ideas would arise which would ameliorate this exponential increase in industrialization, autocratic leaders would proliferate in response to the anxiety of an increasingly claustrophobic and environmentally threatened populace and nuclear terrorism would be seen by poor nations as the only means by which to force the redistribution of wealth from the First to the Third World. Heilbroner's book ended on a pessimistic note. He saw no hope for humanity under these conditions and saw no solution. O'Neill saw himself as supplying a necessary corrective to the dead-endism of Heilbroner's analysis. His space colonies would make an end run around Heilbroner's "Tribulation," in effecting a last-minute Rapture of just enough souls to make such a conclusion unnecessary. Without space colonies, O'Neill saw little hope. In O'Neill's opinion, Earth was a doomed, condemned planet for mankind. Earth was a trap.

For O'Neill, two choices faced contemporary mankind: a global totalitarian regime formed for the express purpose of redistributing wealth and ironing out the inequities of an increasingly overpopulated and underfed world -- or massive space colonization. The physicist closed off all other choices because, in his opinion as in Heilbroner's, the world was out of new ideas, human nature was immutable, people would continue to be greedy and selfish, and time was running out. The outline of O'Neill's scenario bears a striking similarity to the post-WWII conception of the end-times advanced by millennialists such as Hal Lindsey. Like Lindsey, O'Neill's scheme had an inevitable Tribulation and a hopeful Rapture. The Tribulation is inevitable because given the trajectory of world events there can be no other outcome but chaos and

stifling control. Lindsey, too, in *The Late Great Planet Earth*, asked his readers to keep their eyes open for the "signs of the times." "Look for the present sociological problems such as crime, riots, lack of employment, poverty, illiteracy, mental illness, illegitimacy, etc., to increase as the population explosion begins to multiply geometrically in the late '70s," he wrote. "Look for the beginning of the widest spread famines in the history of the world." O'Neill predicted similar crises to instigate the ascension of the elect. According to Lindsey's interpretation of Darbyite dispensationalism such crises will cause the world's people to look for a Messiah. "Look for a growing desire around the world for a man who can govern the entire world," he wrote. "Look for some limited use of modern nuclear weapons somewhere in the world that will so terrify people of the horrors of war that when the Antichrist comes they will immediately respond to his ingenious proposal for bringing world peace and security from war."[388] Both Lindsey and O'Neill saw the imminent appearance of a totalitarian and messianic figure who will play upon the fears of the world's people in an effort to unify them.

By casting space colonies as the final technological answer to the implicit apocalypticism of environmental disaster literature of the late 1960s and early 1970s and the explicit apocalypticism of population disaster books such as Paul Ehrlich's *The Population Bomb*, O'Neill united two forms of freedom in his colonial rhetoric. Not only would exodus to space colonies counter the effects of the environmental apocalypse he admitted would occur without his scheme, he also touted them, as countless NASA officials had done before him, as the extension of the American terrestrial frontier off of the planet altogether. This rhetorical union allowed O'Neill to reveal his space colonization plan as both hopeful *and* patriotic, and it was this union which accounted for the brief passion for his idea within a significant portion of the 1970s American public. It

[388] Lindsey, *The Late Great Planet Earth*, p. 174.

also accounts for the willingness of NASA and the public to quickly jump on board the unbuilt rockets to the space colonies without finding out whether long-term human survival in an extraterrestrial environment was even remotely feasible.

So many examples exist of the use of American frontier rhetoric to justify the space program that it is difficult to find a supportive Congressman, Senator or President, NASA official, or American space enthusiast who *did not* make the concept of space as the new American frontier one of the central, if not *the* central, justification for the funding of the construction of space centers, massive rockets, space stations, moon flights and moon bases, Mars and other planetary missions, space-based anti-missile weaponry, and space colonization. The identification of the new American frontier as space became standard material for NASA supporters, officials, and the American media throughout the Space Age and beyond. While Eisenhower was no great champion of the space dream and no fan of connecting it to a new American frontier vision[389], Kennedy, whose program for the country he himself dubbed the "New Frontier," often referred to the "seas" of space, and the astronauts as "pathfinders" and "pioneers." In a 1962 speech at Rice University, Kennedy noted that the city was benefiting from space funding and said that "[w]hat was once the furthest outpost on the old frontier of the West will be the furthest outpost on the new frontier of science and space."[390] President Lyndon Johnson, a Texan, took the rhetoric one step further by writing in his memoirs that he identified with the astronauts whom he called "those brave pioneers who have blazed new trails across the untraveled wilderness of space" and who were "the folk heroes of our time."

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[389] Eisenhower is quoted as saying, in 1960, in response to a White House staff member's comparison of a moon mission to Columbus' journey to the New World, "I'm not about to hock my jewels," referring to the apocryphal story that Queen Isabella of Spain did so to finance the Nina, Pinta, and Santa Maria. See Henry C. Dethloff, *Suddenly, Tomorrow Came…: A History of Johnson Space Center*. Lyndon B. Johnson Space Center: NASA, 1993. p. 13. http://www.jsc.nasa.gov/history/suddenly_tomorrow/suddenly.htm.

[390] John F. Kennedy. "Address at Rice University on the Nation's Space Effort," *John F. Kennedy Library and Museum Website*. http://www.cs.umb.edu/jfklibrary/index.htm, Accessed April 3, 2004.

"The new adventures in space that lie ahead," he wrote, "will bring with them excitement and accomplishment as great as anything we have witnessed in the epic period just past, when we proved ourselves once more to be the sons of pioneers who tamed a broad continent and built the mightiest nation in the history of the world."[391] However, the use of such American frontier rhetoric in relation to space was a bit of a problem for U.S. Presidents during the Space Age given the internationalist propaganda aims of the program. An endeavor "for all mankind," needed to come first before any national grandstanding. Presidents from Kennedy to Nixon, for the most part, intentionally downplayed or contraverted frontier rhetoric in regard to space. In his 1969 inaugural address, Nixon said, echoing repeated references to space made by his predecessors, that "[a]s we explore the reaches of space, let us go to the new worlds together – not as new worlds to be conquered, but as a new adventure to be shared."[392] However, the fact that Space Age Presidents sought to often downplay the frontier rhetoric shows, paradoxically, how pervasive and strong such rhetoric actually was. Astronauts in the 1960s were continually called pioneers and space was continually referred to as the frontier in the American press, if only circumspectly and cautiously by Presidents.

The connection of outer space exploration to the American frontier began not in the Space Age, however, but in the 1950s enthusiasm for extraterrestrial endeavors which was stoked to a great extent by Germans associated with the former Peenemunde rocket team. The books *The Conquest of Space* (1949), *Across the Space Frontier* (1952), and *Conquest of the Moon* (1953) characterized space as a region to be conquered in much the same way the American West was conquered a century earlier. Willy Ley authored the first one and both Ley and von Braun collaborated on the latter two. These books

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[391] Lyndon Baines Johnson. *The Vantage Point: Perspectives of the Presidency 1963-1969*. NewYork: Holt Rinehart and Winston, 1971. pp. 285-86.
[392] Nixon, 1969 inaugural; also see etc., etc.

were designed expressly for an American reading public and dealt with "conquest" and "frontiers," but were authored by von Braun, an ex-Nazi SS officer, and Ley, an escapee from the Nazi regime but a close associate of the Peenemunde group. Both had, in their earlier years, much exposure and experience with a different nation's propaganda concerning conquest and frontiers.

However, the root of the rhetoric of the American frontier lay firmly in the nineteenth century nationalist concept of "manifest destiny." This millennial idea was rooted in the very birth and proof of success of the American experiment itself. As historian Ernest Lee Tuveson chronicled in his now canonical 1968 book, *Redeemer Nation: The Idea of America's Millennial Role*, the concept of manifest destiny became "[t]he idea that the United States has been called to be the chief means of world-wide redemption, and that as a chosen people it was assigned a new promised land…" According to Tuveson, this idea did not just "look rather like those of apocalyptic prophecies" but that the "vast complex of ideas, policies, and actions" which made up the concept "are literally apocalyptic [and] that they were regarded as the continuation of the biblical prophecies themselves." These ideas were not created as a "religious justification," according to Tuveson, but were "inherited" and a "logical development of premises, begun long before in Britain, about God's plans for universal social salvation through history, the revealed will being interpreted in the light of successive world events."[393]

The 'High Frontier' solution of Gerard O'Neill drew on the increasing portrayal in America, after the trouncing of the Soviets in the race to the moon, of an American manifest destiny in space. Space was the new, empty, American wilderness above. The very moniker of O'Neill's concept, the "High Frontier," stood testament to his attempt to

[393] Tuveson, pp. 91-92.

connect it to an American westering influence. His book included illustrations of spherical "homebuilt spacecraft" on "homesteading" voyages to the asteroid belt, traveling in group formation like an extraterrestrial wagon train, one of the craft emblazoned with the words "Lucky Lady" across the front of its hull. One of his later chapters, concerned with the "striking out" of ex-colonists into deep space and entitled "Homesteading the Asteroids," mixed facts about the supposed ease of family asteroid mining with fictional letters written not back home to Earth but from parents to a son who would probably never visit the planet. O'Neill compared the "diary entries," as he called them with a family diary he himself owned, "preserved through five generations," written by an "old lady" who "wrote an account in verse of a time when she had traveled with her seven sons across the plains of America in a covered wagon." The diary even read like it was written in back of a chuck wagon: "We've been prospecting for the past month, and now it looks as if we've found us a good one…. So we've got some clearing and stump pulling to do, and by the time you're big enough to handle a welding machine you'll be my helper. We've got a whole world to build here, Stephen, so grow up fast and get in on the construction!" Furthermore, O'Neill envisioned space colonization as "an escape from outside interference" and compared the communal life and self-governance aboard colonies and asteroid mining vessels as a revival of the "communal enclaves of nineteenth-century America" such as those of "the Shakers, the Mennonites, the Pennsylvania Dutch, [and] the Oneida Community." O'Neill left out the Mormons who perhaps more than any of these groups connected escape from economic and social oppression in the East with their westward journey to Zion. O'Neill maintained that the space frontier would be fundamentally different from the frontier depredations of the past and thus easier because the space settlers would not face "dangers" such as "hostile

Indians, snows, exposure, and short rations."[394] This transcendence of the bloody frontier of the American West through escape to the airless frontier of space became a popular selling point for *CoEvolution Quarterly* editor Stewart Brand who said, in support of O'Neill's plan, "[T]his time there's a difference in that no Space natives are being colonized…"[395] In his book *2081,* O'Neill surmised that while most humans would live no further than the asteroid belt, groups of anti-socials, reminiscent of the fur-trappers and outlawmen of the frontier American West would move even further away. "A very small number [of space colonists] are likely to be criminals, revolutionaries, or members of extremist sects, eking out a precarious existence on the fringes of civilization, as such groups have done historically," he believed. Such miscreants would be located just far enough away to "prey on, attack, or obtain converts from society," only to slip back into the inky blackness of the solar system beyond the asteroids.

For O'Neill, the uncertainty about the nation's future stoked by the Turnerian phenomena of the "closing of the American frontier" would be cleared up by the colonization of the high frontier of space. While the deeper Christian millennial justifications for the American construction of a manifest destiny of the West were almost always either ignored or unrecognized in O'Neill's writings, the physicist retained not only an idealization of the nineteenth century separatism and communalism which would characterize extraterrestrial colonization, but also a strong demonization of the wasted and troubled land – a land in the midst of a pre-rapture Tribulation – which propelled such communitarian separatists motivated by political rhetoric concerning "free" land to the West in the first place.

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[394] *High Frontier,* pp. 223-248.
[395] Stewart Brand, "The sky starts at your feet," in *Space Colonies,* p. 5

O'Neill's consistent justification for immediate state-sponsored space colonization was the fear that the environmental apocalypses predicted in the late 1960s and late 1970s would ultimately, if not imminently, stifle economic, political, and social growth and progress. Heilbroner, Ehrlich, and the Club of Rome's pessimism concerning the unavoidable zero-growth imperatives of a coming environmentally-savvy society became accurate prophecies of the coming Tribulation which would justify space rapture. O'Neill cast himself as a traditional frontier ethic American who from earliest youth chafed against the pressures of regimentation and always yearned to be free. Whereas von Braun and the Peenemunde group saw space exodus as both necessary to gain the high ground over Soviet totalitarianism and inevitable, as the next logical step in the human conquest of nature, O'Neill saw such exodus as more than necessary and inevitable: he saw it is immediately realizable. The situation on Earth was becoming far too dicey, and space colonization became for O'Neill the only "American" way out of the mess.

In *2081: A Hopeful View of the Human Future,* O'Neill continued his practice of futuristic "science faction" extrapolation but this time included prognoses for what life on Earth would be like post-colonization. In following the travels of Eric, a young man born off of the planet O'Neill described the Earth 100 years hence. This Earth is a troubled planet in the throes of a creeping Hal Lindsey and Darbyesque Tribulation. Young Eric's most interesting visit is to Africa, where O'Neill describes a continent of "military dictatorships" and little capital investment. Eric's escort, the erudite and professorial Aaron, tells Eric how each African nation is "armed to the teeth – nuclear proliferation was total – so every now and then one of their capitals went sky-high when the local out-party manage to smuggle in a nuke." O'Neill's image of Earth, as seen by Eric who has been sheltered in the bliss of Earthlessness for his entire life, is one of nuclear terrorism, vast inequities, and massive multinational corporations – a sort of *Blade Runner* vision of

the future over the entire planet. "At airports in every African nation, as in some countries of South America," he writes, "I found myself oppressed by hard-eyed young guards, each with a machine-gun… There were body searches and x-rays. Two days after I passed through one airport, a nuclear weapon launched from a mortar in a forest destroyed the terminal, killing four thousand people in an instant, others more slowly." Luckily Eric escaped this mini-apocalypse, and after he assures a friend that he is all right, he continues on his bourgeois journey into the still-beautiful African wilderness, leaving on a "leisurely Air Cruise over the wildlife preserves of the Serengeti Plain."[396]

The Earth of O'Neill's space colonization future will be an excessively intrusive and centralized bureaucracy of stifling personal control. Not only did he envision "anklets" as being mandatory in nearly every country on Earth, he also saw the proliferation and centralization of massive computer networks as a grave threat to human freedom. "[I]t would be possible," he wrote, "for a central computer to keep detailed tabs on every human being in any country and update the information every minute or so" and "in the nation where the interests of the state are dominant… the battle will be lost before it's fought."[397] In Russia "anklets were mandatory… and with modern computers the state had no trouble keeping track of everybody," he writes. It is no surprise that most intelligent Russians "chose the Russian colonies in space, where the living conditions were a good deal more pleasant."[398]

In *2081*, he predicted all manner of Earthly futuristic transportation devices, personal conveniences, and leisure activities, but his entire future is predicated upon the supposition that space colonization one hundred years hence will be widespread. For

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396 Gerard O'Neill. *2081: A Hopeful View of the Human Future*. NewYork: Simon and Schuster, 1981. p. 206.
397 *2081*, p. 46.
398 *2081*, pp. 211-12.

instance, O'Neill's prediction about the near-disappearance of organized crime in 2081 rests on the supposition that "wealth and population will be concentrated in space" and since it will be difficult for organized crime syndicates to get a foothold in small, decentralized space colonies of a few thousand people, crime bosses will turn more towards legitimate operations. Such space colonization, in the O'Neillian view, is a necessary prerequisite for the continuance of human felicity on Earth. "For a civilization now tightly constrained within Earth's biosphere and infected with nuclear proliferation," O'Neill wrote, "the most important new possibilities opened by space colonies may be a reduction in the scale of institutions and a dispersion of humanity far outside the bomb-laden pressure cooker that now seals it in."[399] Without such space colonization, O'Neill's vision of the Earth's future would be much darker than that he fantasizes about in his futuristic extrapolations. O'Neill does not devote a great deal of space in his books to the darker future, rather leaving it up to the imagination. His depiction of an Earth post-space colonization is scary enough. To accept O'Neill's vision and take away the colonies would be to logically envision a literal hell on Earth.

In fact, the foil for O'Neill's futuristic vision is exactly that dystopian post-apocalyptic Earth imagined by prophecy writers such as Hal Lindsey. O'Neill's colonies, -- the metallic analogue of the Rapture -- promise to ameliorate the effects of the plague of terrestrial crises. In this sense, O'Neill offers a similar choice for humanity as that offered by Lindsey and other Christian fundamentalists: clean up your act in preparation for the ascension or suffer the consequences of life on Earth.

While O'Neill consistently used statistics he gleans from the environmental movement, such as Ehrlich's *Population Explosion* predictions, and frequently incorporates ecological aesthetics into his prophecies of the future, his vision of Earth is

[399] *2081*, p. 62.

always of a tenuous, dangerous, threatening, and brutish locale. O'Neill's vision, in fact, is exactly that dystopian perspective on 1970s urban life and its future which pervaded contemporary discourse and which was often employed to contrast space expenditures against "earthly" expenditures. For O'Neill, the Earth was morphing into a giant, sprawling, megalopolis – a humming mega-computer of stifling control. The colonies, then, become the fulfillment of the dream of the perfect city, but one necessarily removed from the control of Earth and gravity. The colonies are the heavenly city, lording above like the New Jerusalem of John and Cotton Mather, perfectly ordered, free of desire and want, and shining like a beacon unto all the nations below on a miserable Earth.

## 11: The Heavenly City

Rapture in conjunction with horrifying Tribulation, and then… Heaven: this is the core drama of the Christian apocalypse. The emigration of humanity off of a troubled Earth and into inverted Earths of utopian perfection and bliss is the translation of the Christian apocalyptic into the very hulls of the rockets of deliverance. By understanding that the roots of O'Neill's space colonies lie in the Christian millennial drama, we can see how the colonies were meant to be technological heavens. Although made of metal and in the present day, O'Neill's colonies emulate and materialize the characteristics of heaven imagined to exist since the earliest visions of the Christian ethereal realm. The space colonies are metallic materializations of the heavenly city replete throughout Christian ethereal literature beginning in the 3rd century A.D. And like these imaginations of a celestial abode for the blessed, the colonies are also celestial Edens, and thus the completion of the circle of Judeo-Christian cosmogony, history, and destiny prophesied to occur on a roughly 6,000-year island of limited time in a sea of forever.

In the twenty-first chapter of the Book of Revelation John prophesied the passing away of the "first heaven and the first earth," which were to be replaced by a "new heaven and a new earth." John wrote that he saw "the holy city, New Jerusalem, coming down from God out of heaven…" This New Jerusalem was full of light, "like unto a stone most precious, even like a jasper stone, clear as crystal," and "had a wall great and high, and had twelve gates" and "twelve foundations" garnished with jewels. John gave exact measurements of the "length and breadth" of the sides of the perfectly square city which were "twelve thousand furlongs" or 1500 miles long. The height of the walls was a "hundred and forty and four cubits" or almost 200 feet high. Each of the twelve gates consisted "of one pearl" and the streets were made of "pure gold." The city was self-

contained and lit from within by the "glory of God"; "the city," John related from his vision, "had no need of the sun, neither of the moon, to shine in it." In the city there would be "no night…"

The "saved" nations would "walk in the light" of the city while "the fearful, and unbelieving, and the abominable, and murderers, and whoremongers, and sorcerers, and idolaters, and all liars, shall have their part in the lake which burneth with fire and brimstone." The closed, self-contained city of the New Jerusalem would have no need for the extraterrestrial cosmos, and no need for those who did not accept the vision of John or the message of Christ. The saved would live in the interior bliss of the perfectly square city and the damned would burn alive for eternity outside.[400]

This vision of a future paradise city became the blueprint for subsequent imaginations of the Christian afterlife in the two millennia to follow. By the eleventh and twelfth centuries, as the medieval cities of Europe grew in wealth and power, the urban imagery of the Book of Revelation acquired increased relevance to friar-theologians of the era. According to scholars Colleen McDannell and Bernhard Lang, Christian piety became concentrated in these rising urban centers. "Money and piety," they observed, "blended to vitalize Christian culture… Townspeople, apart from the poorest, exhibited a more vibrant and intense piety than that of the peasants and the aristocracy. In the new cities, Christianity acquired an emotional quality not often experienced in villages and manor houses."[401] Medieval theologians, most of them living and writing within the walls of a rising urban environment, found ample scriptural and experiential credence to characterize the coming perfection as occurring within a brilliantly lit, jewel-bedecked, and self-contained city-heaven.

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[400] Revelation 21. King James' Version.

[401] Colleen McDannell and Bernhard Lang. *Heaven: A History*. New Haven: Yale University Press, 1988., p. 73.

Christian contemplatives such as Giacomino of Verona, a Franciscan friar, and Gerardesca, a female tertiary (a nun), elaborated on the Revelation vision of the heavenly city, variously imagining walls of "rare marble" and "seven castles" filled with the most blessed disciples, as well as Jesus and the Virgin Mary, with all of the most holy dwelling within according to their rank and status in a medieval court hierarchy. The depiction of paradise as city continued through the Renaissance, as painters such as Fra Angelico gave life and color to heavens imagined as possessing contemporary architecture placed seamlessly within gardens where the blessed cavorted sinlessly. The fifteenth century Dominican friar Savonarola positioned heaven beyond a circle of jewels encircling the universe. The inhabitants of Savonarola's heaven floated weightless between celestial gardens and the celestial city. Hieronymous Bosch also painted heaven as a city, with a gothic and open cathedral architecture containing the most blessed hierarchy floating above a blissful garden of love and peace.[402]

By the early modern era, visionaries such as Emanuel Swedenborg were imagining the heavenly city anew. Heaven, Swedenborg maintained, was accessible through a form of astral vision, and consisted of "avenues, streets, and squares," houses inhabited by angels with "courtyards" and surrounded by "gardens, flower beds, and lawns." For Swedenborg, whose visions would have a profound influence on the nineteenth century American spiritualist movement, as well as on diverse individuals ranging from Henry James, Sr., the father of Henry and William James, to Johnny Appleseed, the Earth existed in material correspondence to a spiritual heaven, so the existence of a celestial city was, in this view, a foregone conclusion. Swedenborg would even produce a rough sketch of his vision of the heavenly city as seen from on high. The Swedenborgian heaven, not static and sexless as in the imagination of Aquinas, was

[402] McDannell and Lang, pp. 74; 118-21.

material and sensual and even democratic, filled with earthly delights, and yet sinless. His vision of a less harshly hierarchical and pleasant heaven would become the dominant consciousness of the celestial realm in the modern age.[403]

The vision of the heavenly city remained strong into the late nineteenth and early twentieth centuries as wildly popular American preachers such as the Presbyterian minister Thomas DeWitt Talmage conceived of heaven as a bustling urban realm, similar to the streets outside the Brooklyn Tabernacle pulpit from which he delivered his widely published sermons. Heaven, for Talmage, was a "great metropolis," replete with "boulevards of gold and amber and sapphire."[404]

Yet the popularity of the liberal Swedenborgian conception of a rather non-judgmental afterlife made significant inroads into Western thought, and often in those outside the church, but still genealogically and intellectually bound to the Christian conception of linear progress toward a golden age. The Swedenborgian heaven became popular among those who held to a vague yet positive vision of the afterlife, such as that taught in the less strict denominations of the nineteenth and twentieth centuries. But not all shared this vision of a heaven reformed, and correspondent with Earth. Although it became popular in the Western world, especially in the United States, which did not see a drop in Christian belief and imagery as experienced in twentieth century Europe, Biblical literalists eschewed such a departure from the heavenly perfection and condemnation of sensuality present in Scripture. Throughout the twentieth century, Biblical literalists slowly began to withdraw from encouraging their followers to imagine heaven at all, and by the post-WWII era, many evangelical and fundamentalist denominations expressly

[403] McDannell and Lang, pp. 181-227.
[404] McDannell and Lang, p. 279.

preached that heaven was unimaginable and should not be materialized in thought or word.[405]

As the conception of the heaven began to cleave between those who eschewed any description of the realm, those who imagined it as a world not unlike Earth yet more perfect, and an intermediate position in which heaven became vaguely conceived not as a place, and not as unimaginable, but as a pure state of joy, peace, and love, the technologies of exo-millennialism began to offer the materialization of a heavenly city in the immediate future. This new technologically deterministic image of heaven assumed the migration of evolutionarily and intellectually advanced humans into the realm of outer space. Space, increasingly deemed and imagined conquerable, became the ex-heaven in which humanity would construct a mechanical rendition of the prophesied Biblical paradise replete with the promise of immortality, benevolent and angelic extraterrestrials, and as self-contained and societally perfect as the celestial city of the medieval imagination.

In the extraterrestrial imagination of Konstantin Tsiolkovsky, space was a realm of unquestioned perfection given its absence of unhealthy gravity and Earthlessness. He also imagined, in his science fiction and fact treatises that the beings inhabiting this realm dwelled in celestial structures very similar to the medieval city heaven. In his writings he variously described structures such as a "magnificent palace," an "air castle," rooms of abundant greenery and "golden sunbeams," and a "transparent vaulted city."[406] Tsiolkovsky was not a terribly good writer, often switching back and forth from one idea to another and his descriptions of the images in his head when imagining these locales are often sketched and never fully rounded out. However, the giddy enthusiasm which

[405] McDannell and Lang, p. 335-345.
[406] Konstantin Tsiolkovsky. *The Science Fiction of Konstantin Tsiolkovsky*. Adam Starchild, ed. Seattle: University Press of the Pacific, 1979.

pervades his stories – he is fond of the exclamation point -- would lead the reader to believe that the visions of these zero-gravity extraterrestrial structures were a large reason for his lifelong devotion to writing about them.

Tsiolkovsky characterizes the architecture of his celestial abodes as self-contained, weightless, and amply supplied with all manners of perfection, but he does not see them as square, as in the Book of Revelation Holy Jerusalem. Instead, Tsiolkovsky has a different geometric vision – one of perfect, supple, and edgeless spheres. Tsiolkovsky imagined that future space habitats would be self-contained spherical vessels and he devoted many pages to describing their composition and appearance. These spheres would be, according to Tsiolkovsky, self-contained and hollow mini-Earths, very similar to those which O'Neill would campaign to be built in the 1980s. At one point, while the guest of a race of planetoid-dwelling extraterrestrials, he is provided "an enormous hollow metal sphere" to rest in, where gravity, which he claims he "had come to miss" was artificially provided for him. This sphere, "at his service" whenever he desired to enter it, was "full of air, light and plants which regenerated the atmosphere" and which supplied him "with all kinds of the most delicious fruits (unknown to you terrestrial inhabitants)…" He reclines in an extraterrestrial armchair and gazes out the window, filled with peace, and imagines he is the only inhabitant of the entire universe. "Through one window," he writes, "I saw the black sky with stars that did not twinkle, through others the bright, bluish Sun. It seems as though the entire heavenly firmament with the stars, Sun, the planetoid and its rings were revolving round with me in the centre…"[407]

[407] Konstantin Tsiolkovsky. *The Science Fiction of Konstantin Tsiolkovsky*. Adam Starchild, ed. Seattle: University Press of the Pacific, 1979. p. 123

Throughout the twentieth century, the idea of a low-gravity heavenly city in space largely took a back seat to visions of a less ambitious stepping-stone to full-scale space habitation – the Earth-orbiting space station. While the dream of space colonization always existed as the ultimate and inevitable consequence of spaceflight, rocketeers such as Oberth and von Braun recognized that by advocating a gradualist approach to the heavenly city, their ideas stood a far greater likelihood of being accepted by a largely extraterrestrially ignorant public. The imagination of cities in space – either ruled by higher extraterrestrials or an elite portion of humanity possessed of and in control of superior technology – became a common and increasingly popular theme in science fiction from the dawn of the age of rocketry onwards. Countless examples of space cities in free space and more commonly, on planetary surfaces, exist in science fiction literature written in Russia, Germany, and the United States and the theme continues to be highly popular. Such stories litter the 1930s American science fiction pulps, as in Manley Wade Wellman's short novel *Island in the Sky*, published in *Thrilling Wonder Stories* in 1941, where a group of airmen, frustrated by consistent and unstoppable terrestrial wars, establish Earth-controlling cities twelve to fifteen miles above the surface, and such themes resulted in long running series devoted to the vision, as in the many Mars novels of Edgar Rice Burroughs.

But the space station vision became the practical route to such far-off fantasies. Envisioned by nearly every single rocketeer, it would be the salesmanship and technical savvy of Wernher von Braun which would embed in the American consciousness the practicability of the construction of space stations, which in actuality could be seen as initially all-male space villages, exo-millennial monasteries, or proto-colonies. In the late 1940s and 1950s, as a newly naturalized American, the ex-SS officer sold the vision with a fervency and devotion approaching that of countless Christian preachers pointing

towards an inevitable and glorious heaven. Historian Cornelius Ryan became one of von Braun's earliest American converts. Years later, his wife recalled the effect the "mesmerizing" and "striking blue-eyed blond German" had on her husband after his return from a 1951 Hayden planetarium space symposium from which he hoped to cull a magazine article for *Collier's*. "He came back trying to figure out how to get *Collier's* interested in space stations, spaceships, and flights to the Moon," Connie Ryan recalled, "He told me: 'This man could convince anybody. His dreams, his ideas are mesmerizing. He is so effective that he could sell anybody anything. Even used cars!"[408] Instead of one article, Ryan would co-author a series of articles with von Braun on the space vision – articles which, in their air of excitement and inevitability greatly influenced the American public to begin dreaming of an extraterrestrial deliverance from the nuclear brinksmanship of the heatening Cold War.

This series of articles, later published in two popular and lavishly Chesley Bonestell-illustrated books, *Across the Space Frontier* (1952) and *Conquest of the Moon* (1953), became the blueprint for NASA's vision of both space stations and lunar bases well into the 1970s and beyond. Von Braun's space station plans in *Across the Space Frontier* called for a circular structure not in the shape of a sphere but instead of a hollow wheel. With a crew of eighty men, this wheel would supply its inhabitants with an atmosphere created through the heating and dispersal of Earth-transported liquid oxygen, food with a low-waste content (also from Earth), three floors of living and working space, "space taxis," powerful computers, and a 24-hour view of the spinning planet below. A sectional view of the space station, illustrated by Fred Freeman, showed an all-male contingent of military personnel, some in jump-suits, some in suits and ties, performing

[408] Quoted in Ernst Stuhlinger and Frederick I. Ordway III. *Wernher von Braun: Crusader for Space*. Malabar, Florida: Krieger Publishing Company, 1994. p. 113.

various duties about the multi-roomed, multi-floor station-fort. The hub of the station, where cargo from space taxis would be unloaded, was weightless and stationary, and the personnel moved freely, through an air lock, from their floating state to the rotating wheel where gravity was manufactured.[409] The internally lit station, which would have little use for the light of the sun and moon, was designed by von Braun as both a missile-launching and surveillance platform from which to both prevent and win the, as some saw it, inevitable nuclear conflagration which would consume the Earth below.

While the medieval and Renaissance heaven would be a self-contained and self-sufficient town with architecture befitting the period, the space colony visions of Gerard O'Neill would also take their cues from the best urban landscapes of the 1970s. Central to the rhetorical battle which characterized the transition from the Space Age to the Earth Age was the symbol of the city. The contrast between the polluted blight of American cities in the 1960s and the gleaming futurism of the space program provided a powerful basis for criticism of the entire space endeavor. It was difficult to argue with the observation that while environmental and social conditions in the cities were worsening in the wake of riots, choking air, and rising crime, a great deal of money was being spent on a propaganda spectacular on the moon.

O'Neill's space colony proposal was at least in part a response to this valid critique. Instead of trying to reform and modernize terrestrial urban centers, O'Neill's fantasy involved the complete removal of the modern city from the natural environment with which it had done battle since the Industrial Revolution. Space colonies would be a bold step in the evolution of the urban ideal: a completely controlled environment of convenience, pleasure, and a quasi-spiritual ethereality of placelessness. Carl Sagan, asked for his opinion on the idea, objected to the term, "space colonies" as it, in his

[409] Cornelius Ryan, ed. *Across the Space Frontier*. New York: Viking, 1952. pp. 106-107.

opinion, “conveys an unpleasant sense of colonialism.” Instead, Sagan suggested that the colonies be referred to as “Space Cities.” Sagan imagined that the space colonies could be extraterrestrial Amsterdams, New Yorks, Hong Kongs, or San Franciscos, urban free zones of culture, technology, and learning, a humanistic and off-Earth version of Bacon’s *New Atlantis*. “The earth is almost fully explored and culturally homogenized,” he wrote in the *CoEvolution Quarterly*. “There are few places to which the discontent cutting edge of mankind can emigrate. There is no equivalent of the America of the nineteenth and early twentieth centuries.”

> But space cities provide a kind of America in the skies, an opportunity for affinity groups to develop alternative cultural, social, political, economic and technological life-styles. Almost all the societies on the earth today have not the foggiest notion of how best to deal with our complex and unknown future. Space cities may provide the social mutations that will permit the next evolutionary advance in human society… Such a commitment might be a very fitting Bicentennial re-dedication to what is unique about the United States.[410]

NASA officials consistently appeared bedazzled in the light of O'Neill's levitated cities. No NASA higher-up lavished more praise on the plan than Jesco von Puttkamer, the heir to von Braun's position as Director of Advanced Programs in the Office of Space Flight. Von Puttkamer claimed that O'Neill's colonies were one possible and logical end result of the inexorable and deterministic "natural force" and that mankind was not "driving" into space, but being "driven" to the "humanization of space." Mankind, von Puttkamer claimed, was being driven to "spread life" and that belief in this ideal was "something of a religion – a matter of faith rather than provable evidence." "Since it is a driving force toward higher goals and higher meaning," von Puttkamer wrote in a letter in *CoEvolution Quarterly,* "some people call this power God but that is an expression which came into existence because of the deficiencies of other explanations." Von Puttkamer believed that "[o]nce self-sustaining communites in space are established, the human race

[410] *Space Colonies*, p. 42.

would go on even if there is a disaster on Earth, an environmental catastrophe, a nuclear holocaust, or a major climatic change due to changes in the Sun." For von Puttkamer, O'Neill's vision would effect God's will in whisking at least a portion of humanity a safe distance from a doomed planet.[411]

O'Neill's colonies resembled historic evocations of heaven in a variety of ways. The gravity-free environment, already discussed, promised the angelic weightlessness of the Renaissance city-garden heaven. The absence of animal irritants was a common feature of heaven stretching as far back to Thomas Aquinas' exclusion of lower beasts from his static paradise. In *The High Frontier*, O'Neill was more charitable than Aquinas in sagely noting that "[m]any animal species are a pleasure to us, and if we move into space both we and they will benefit from our taking them along – perhaps, like Noah's passenger list, two by two." O'Neill looked forward to extraterrestrial squirrels, deer, otter, and birds, but thought it would be a joy to "leave behind some parasitic types: how delightful would be a summertime world of forests without mosquitoes!"[412]

But it would be in the two most historically recurring features of heaven that O'Neill would reserve the most discussion, and which would raise the most controversy in the studies funded by NASA and led by the physicist himself: the extraterrestrial architecture of the colonial interior, and extraterrestrial experience of light within that interior. In his earliest visions of the Bernal Sphere, O'Neill was short on interior architecture, confining his plans to rough sketches of the entire colony and mathematical dimensions. However, as his plan gained public support and interest, O'Neill enlisted the help of various 1970s space artists to flesh out his vision. The dominant vision of the

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411 Jesco von Puttkamer, "On Humanity's Role in Space," *Spaceflight*.
412 *HF*, p. 49

physicist for his imminently realizable colonies would be the contemporary architecture of California and specifically Bay Area suburban housing.

The illustrations of Don Davis would become the most popular and sophisticated extrapolations of O'Neill's vision. It is no exaggeration to say that without the space colony art of Don Davis, Gerard O'Neill's colonization proposals would probably never have received as much attention as they did.[413] Brilliant, colorful, and almost hypnotic in their depiction of humanity living happily and healthily inside space-based cylinders of metal and glass, Davis' art helped define the utopian dream of space colony freedom for an entire generation of space enthusiasts. It is in Davis' depictions that we can catch a glimpse of the fructification of O'Neill's utopian-Edenic goal, set free from the formulas and rough, uninspiring sketches created by the colonization king himself.

Davis' space colony art was a departure from the genre. Previous space artists – most notably Scriven Bolton and Chesley Bonestell – were naturalists in that their depictions of outer space were typically limited to the barren and beautiful surfaces of exotic planets and moons. They were not artists of a hypothetical "space life" and they certainly would never have thought of placing men and women in contemporary fashions within any of their extraterrestrial landscapes. Like Albert Bierstadt and Thomas Cole and other grand painters of the American West – artists who were unable to complete their massive canvases at the foot of Yosemite Falls, or in the high mountains passes of the Colorado Rockies -- Bonestell and Bolton could not visit the landscapes in their mind. Working from the imagination, or from photographs, Bonestell and Bierstadt helped define the grandiose and wild image of their respective subjects. Occasionally, Bonestell would place a hypothetical astronaut in his spacescapes, but such astronauts would be

[413] Historian Michael Michaud said of Davis' art in relation to O'Neill's popularity: "…O'Neill's ideas received a huge, if subtle, boost from the widely reproduced paintings of Don Davis…" Michaud, p. 68.

heavily suited and tiny figures in a vast, barren, canyon-pocked alien environment and appeared primarily for size comparison with the features surrounding them.

Davis on the other hand pioneered the creation of a new form of space art: the translation of modern life, without drastic extrapolations about future fashions, styles, and personal technologies, into a landscape straight out of science fiction. The strategy behind this mix of contemporary fashion with large-scale futuristic technology derived directly from O'Neill's urgent goal – the creation of operational space habitats within a few short decades – no later than the mid-1990s. By incorporating images of fashionable 70s youth replete with bell-bottoms and beards into space colonies situated in an indeterminate future, Davis helped O'Neill communicate his utopian vision of immediate space habitat construction. O'Neill claimed that his space colonies could be constructed with all present-day technology – a sort of off-the-shelf, post-Apollo mechanic's dream. As such, Davis' depictions of hypothetical space colony inhabitants as 1970s hipsters helped O'Neill drive home his point about the immediate possibility of space colonization. It could happen NOW if the people wanted it.

The most captivating facet of Davis' space colony subject was the absence of the traditional relation between up and down. Since the space colonies proposed by O'Neill were invariably circular or cylindrical in design, Davis had to attempt to depict human existence in a weightless medium and in a tubular and spherical architecture never before experienced. In O'Neill's colonies, human habitations would be placed along the interior surface of an orbiting sphere or cylinder. By looking across the expanse, from one side of the sphere to the other, a hypothetical space colonist could look down into the backyards of his fellow colonists. Not only would the surface of the Earth now be on the inside of a sphere, but the cloud systems – the microcosmic Earth atmosphere – would

also have to be depicted in the center of the colony, presumably raining down, up, and all around.

Once O'Neill and Davis' Earth is turned inside-out, the exterior of the hypothetical space colony should reflect the surface of the Earth which was formerly on the inside, unseen. In the imagination of O'Neill, this new exterior surface would be a mishmash of antennae, mirrors, metal and glass. Is this how O'Neill envisioned the interior of the Earth? The space colony exterior perhaps reflects the technocratic vision of the dream of a well-regulated mechanical interior of an inverted Earth – as if the ground beneath our feet actually contained a giant, all-knowing, consistently humming clean room, within which a silicon computer network conspired to create the organic and natural reality of life on the surface. In O'Neill's colonies, as in Davis' paintings, the natural is relegated to a position far below the manmade. Earth has become nothing more than an architecturally mind-blowing garden box of steel and mirrors.

One cannot help but notice the inspiration of the Earth as seen from outer space in Davis' paintings. Perhaps Davis' most popular image was the one which appeared on the front cover of *Space Colonies*, a book published by Stewart Brand, the editor of the *CoEvolution Quarterly*. O'Neill personally instructed Davis to use the view of the San Francisco Bay Area from Sausalito for inspiration for this "late-model" cylindrical space colony.[414] Brand wrote that this one image "inspired more belief and roused more ire than any other artifact associated with Space Colonies… The man-made idyll is too man-made, too idyllic, or too ecologically unlikely – say the ired. It's a general representation of the natural scale of life attainabile in a large rotating environment – say the inspired. Either way, it makes people jump."[415]

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[414] See Appendix F.
[415] Brand, *Space Colonies*, p.3.

In the Sausalito-inspired image, the cylindrical nature of the colony is cloaked by a projected blue sky and clouds, but if one looks closely, near the upper portions of the image, the lights of the other side of the colony can be glimpsed past the sky. It is as if someone took a map of the Bay Area, rolled it up into a cylindrical tube, and then used that as the blueprint for this space colony. Davis' image is dominated by the Bay Bridge in San Francisco, with the bay packed with extraterrestrial sailboats, the city just beginning to be cloaked in man-made darkness, and white puffy clouds and brilliant sun illuminating the verdant wilderness hills surrounding the waters. In the foreground, two women and a child lounge by the banks of an undammed river amongst butterflies and saplings, perhaps listening to the babble of the space colony's recycled water streaming past moon rocks placed in the path of the flow as it dribbles inexorably down the soil-covered shell of the sphere to the Bay far below.[416]

The near future imagined by Davis and O'Neill was a future claimed by the aesthetic of the environmental movement. Another of Davis' popular space colony images was even more expansive and mesmerizing, and reduced the urbanity of the colonial reality to a distant darkness visible only as the lights of a far-off and lonesome extraterrestrial city. Here, Davis and O'Neill's vision of a man-made space wilderness reached its fullest degree of environmental-extraterrestrial fantasy. Instead of a city, an untrammeled Northern California wilderness dominated the foreground, filled with pines and head-high oak trees, dotted by small lakes, and framed by venerable and ancient-appearing sandstone bluffs. Six curved hexagonal sections comprise the now-cylindrical colony, alternating between three of miles-long windows, and three of wilderness. At the zenith, a window opens out onto the sky where in the center is an eerie and captivating

[416] Cover, *Space Colonies*.

vision of the Moon almost completely eclipsing the Sun, casting a soft pink light on the interior clouds and the landscapes below.[417]

However, as O'Neill's cylindrical Earth-imitative utopian ideal met the engineering realities of the 1975 Summer Study, the artists' depiction of his colonies adapted to the more cramped and presumably more realizable geometry of the Stanford Torus.[418] Davis attempted to integrate the wilderness of the second and third stage space colonies into the new vision with limited success. Using the same brilliant colors and environmental motifs, Davis created an image of space colony life within the Torus.[419] Instead of a colony with a large city and an even larger wilderness, the Torus painting combined the two. No alternating wildernesses and cities filled the colony sky. All of the architecture and landscaping existed on the inner surface of the outer rim of the Torus wheel, stretching upward in the background of the painting. Instead of open skies letting out onto Sun, Earth, and stars, beveled mirrors on the interior of the Torus wheel concentrated light onto a Oregonian landscape of tall pines and spring green grass. A postmodernist architecture of reflective windows and curved shells poked up from lush green lawns, the whole colony surrounding an aqua blue lake with multiple coves. Figures in the foreground walked to and fro, descending via escalators into a sub-colonial network that one imagines extends beneath the lawns and lake. The simulated surface of this new tubular Earth exists as recreation, the real work and maintenance of the colony going on in artificially lit hallways and corridors unseen in the painting.

In reflecting on his paintings more than two decades later, Davis emphasized that his images were informed by the environmental aesthetic of the era. “I deliberately wanted to imply the challenge of trying to transplant a workable ecosysyem to a giant

[417] See Appendix I.
[418] See Appendix J.
[419] See Appendix K.

terrarium in Space," claimed Davis. "Most other depictions are dreary mega-shopping mall like structures filling the available volume."[420] The "other depictions" and "shopping mall like structures" Davis was thinking about were most likely those painted by rival space artist Don Dixon, who produced many illustrations for T.A. Heppenheimer's book about space colonies *Colonies in Space*. Heppenheimer, a veteran of the 1975 Summer Study that proposed the construction of the Stanford Torus geometry for space colonies, covered much the same ground as O'Neill, but with the Study's more "realistic" conclusions in mind. Dixon's cover art for Heppenheimer's book concentrated on the interior architecture of the tubular "Stanford Torus" space colony, complete with a setting taken straight from the shopping mall architecture of the Simi Valley. Glass boxes, geometric patterns, and rich, but incidental, greenery surround a central plaza which gives the impression of being one of those concrete internationalist architectural experiments found across college campuses and government complexes constructed in the 1970s. As in Davis' vision of a Northern California ecosystem in space, Dixon depicted the Sun peeking out from a dark eclipsing Earth. In the foreground, a beautiful woman in a fashionable Japanese kimono tended to her ferns, the outward side of her house a colorful glass façade of Mondrianesque squares and rectangles. On the "hill" into which her house is embedded rise stilted domiciles of reflective glass. Bonsai, palms, and cypress punctuate the landscape. While greenery dominates the foreground, the background resembles a futuristic and uninhabited mall. Right angles and glass dominate, the sky a brownish-orange haze, interrupted by a metal band running into the distance, itself supported by a cylindrical tower lit from within. Other Torus images rendered by Dixon for the 1975 Summer Study gave even less attention to greenery, their

[420] "Donald E. Davis career overview up to now," Personal Website of Donald Davis. http://www.donaldedavis.com/PARTS/SHORTBIO.html. November 10, 2003.

spacescapes dominated by the cramped conditions necessitated by the new geometry, and full of the "dreary mega-shopping malls" which Davis objected to.

The 1977 NASA Ames Summer Study concerning space colonization, also directed by O'Neill, was a much more serious and sober affair than its predecessor. While the 31 study participants credited in 1975 were largely students and professors interested in an exercise in engineering education, the 1977 study was composed of forty senior research workers and only ten students. At the same time, the more rigorous 1977 study used far fewer graphics than its predecessor – only six compared with sixteen in 1975. The images, painted by space artist Michael Prezkop, reflected the increasing emphasis by NASA on the industrial aspects of O'Neill's plan, with only two of the six images depicting any aspect of the space colonies themselves and only one of these depicting life within the low-gravity space habitat where the proposed 10,000 initial colonists would dwell. In contrast, the majority of the sixteen images in the 1975 study depicted various aspects of the space habitat. And Prezkop's one illustration of the coming O'Neillian heavenly city depicted an even more crowded and postmodern urban environment than those previously envisaged by Davis and Dixon.[421]

Prezkop's heavenly city resembled a dense urban downtown of an ultramodern American metropolis dotted with ornamental greenery wedged between cylindrical office towers and structures of metal and glass. The sky was blue with seeming little hint that one was within a constructed spacebound shell save for the presence of several ultra-futuristic UFO-shaped disks above which seemed to serve as both office space and sky support. Instead of the long curved vistas of Davis and Dixon's spherical, cylindrical, and toroid colonies, Prezkop's colony was a relatively cramped bubble city with none of the long sight lines or wilderness previously promised. Dominating the image were grinning

[421] See Appendix L.

and exhilarated male and female colonists, all Caucasian, dressed as if for a California summer but floating freely in the foreground, spinning and flying with the help of small backpacks with which they jetted themselves about the colony through the manipulation of a handheld remote control. Of the five hovering figures in the foreground, three were male, all facing the viewer, and two were female, both seen from the back, their long bare pink legs stretched taut as they swam through the manufactured air. This image was the last used by NASA to depict the space habitats of O'Neill, which by 1977 had shrunk in possibility from an imminent dream of Earth-space grandeur, to an increasingly unrealistic hope for the construction of a tiny, encapsulated model downtown of the future such as one would find in the soon-to-be-opened Epcot Center in Disneyworld.

The space cities of Davis, Dixon, and Prezkop's art, when compared with medieval, Renaissance, and Swedenborgian images of the heavenly city, blend suggestively into the backdrop of visions of the religious ecstatics of old. Both imaginations – one of urban heaven, one of the extraterrestrial urban city -- envision weightless beings flitting betwixt garden and airy castles, the risen inhabitants contentedly tending to their life of seeming eternal bliss, with work a joy and joyful lives. This was O'Neill's vision, and the ultimate fulfillment of the vision of the rocketeers which preceded him and informed his extraterrestrial architecture: the Rapture of the techno-elect above the pesky and deadly Earth into a centrally controlled, self-contained, and self-sufficient garden paradise. But as the space colonization dream began to fade into geometries less conducive to the realization of the spherical heaven – as the garden became crowded out by the machine – the dream became less and less palatable, and not only to the American public but to O'Neill himself. By the 1980s, his dream was already the fad of an enthusiastic and outdated apocalyptic era. Like a meteor across the sky, O'Neill's dream vanished as quickly as it arrived, leaving a few true believers but even

more who regretted their initial ecstacy in its brilliant illumination of a heaven unattainable. But it would take the death of one particular and inextricable element of the physicist's dream to blink out the meteor's flash – the death of the element which, paradoxically, was all that ever truly separated 1970s space colonization fantasies from the Christian heaven since before the *Summa Theologica* of Aquinas. With the death of the billion lights of the universe – the blazing stars, the hovering moon, and the life-giving Sun – those lights which were promised to illuminate the perfect Earthly interiors of humanity's near-term destiny – space colonies became impossible without the encapsulation of their inhabitants forever from the sky. Just as John predicted two millennia before, the new heaven "had no need of the sun, neither of the moon, to shine in it" and when the space colony sky became impossible without a sealing shell of metal, the American people, the American government, and NASA turned away from this entombment and turned away from the colonies. With the death of starlight, sunlight, and moonlight, the belief that heaven could wait became ascendant, eclipsing O'Neill's dream into a darkness from which it has yet to emerge.

## 12: Divine Light

One of the most enduring themes in medieval cosmology is the divine quality of light. Religious historians Colleen McDannell and Bernhard Lang note that in Neoplatonic philosophy light is "something divine – an emanation from God." The quality of light demonstrates divinity, and darkness, death.

Thomas Aquinas imagined the bodies of the raised elect would "shine seven times brighter than the sun." In the view of Albertus Magnus, the more virtuous the Christian figure on Earth, the brighter their form in heaven. "The saints will receive different degrees of clarity according to their different degrees of merit," he wrote. In the cathedrals of Europe, the congregant bathes in the glow of God's divinity, shining as if in the self-contained new heaven prophesied by John in the Book of Revelation. Not needing the lights of the Earthly sky, the heavenly city would be lit by the "glory of God."

In the initial space colony architecture of O'Neill, the colonists could be bathed in full sunshine whenever so desired.[422] Not subject to the mindless rotation of the Earth, space colonies would be able to exploit the light and energy of the sun constantly and forever. The admittance of light would be centrally controlled. "The angle of the sunlight will be controllable," wrote O'Neill in *The High Frontier*, "and will depend only on the lengths of the cables which hold the mirrors." O'Neill recognized that the human biological clock, despite the possibility of 24-hour sunshine, would need Earthly day and night for the sustenance of life.

> As the mirrors slowly open in the morning, the Sun will rise, but will move in the sky only as fast as it does on Earth; there will be no suggestion from its appearance that the cylinder is actually rotating… With control over the angle of

[422] *HF*, p. 49.

> the Sun in the sky, the residents of space will also have control over the lengths of their days, the variation of the day-length, and so the average climate and the season. They are unlikely to indulge in any sudden or capricious changes in those variables.[423]

If O'Neill's special-interest space colonies were inhabited by sun-worshippers of the Californian variety, then all it would take would be a slight adjustment, and voila! Endless summer.

O'Neill's space colony vision always went hand in hand with a near-deification of the sun. From the solar power satellites he hoped would fund their construction and proliferation to the Pacific Coast verdancy of his residential and agricultural areas, the space colonies were touted as potentially immune from darkness. The colonists could glow for eternity in the heavens. O'Neill's imagination concerning life in the colony was predicated upon his California home, but on closer examination his descriptions of the colonies bear a striking resemblance to medieval and Renaissance descriptions of the half-urban, half-garden heaven. Suffused by light, and forever free of the Earth, O'Neill's colonies resemble the metallic fulfillment of the Christian paradise.

O'Neill's claimed that the constant light of the sun would confer two huge benefits to those who chose extraterrestrial living. First, he assumed that agriculture would flourish in such an environment. Second, he assumed that by constructing his colonies out of thick windows and mirrors, his colonists could forever bathe in natural sunlight. His earliest schematics for the colonies made this idea seem feasible, but in reality O'Neill worked backwards from a dream of how wonderful life would be bathed in eternal extraterrestrial light to the assumption that such an existence could be easily manufactured. When O'Neill's ideas fell under closer scrutiny, even within the study he commandeered, his assumptions were found to be very misguided. Space life would be

[423] *HF*, p. 68.

much more like that envisioned by J.D. Bernal: a windowless existence inside a metallic shell.

The idea that the abundant sunlight of outer space would be the perfect locale for year-round farming was always one of the primary justifications for extraterrestrial migration and it held a prominent place in the writings of both Tsiolkovsky and Oberth. Such a notion was based on the observation that in the northern climates where rocket-powered spaceflight first became a fantasized means of terrestrial escape, the boom and bust cycle of the seasons mitigated against year-round harvests except through meticulously maintained greenhouses. Introducing greenhouses into outer space seemed, if one ignored or explained away the difficulty of transporting air, water, fertilizer, and farmers off of the planet, to be the perfect solution to winter. Just as greenhouses appeared to be self-contained producers of foodstuffs even through the dead of winter, Tsiolkovsky and O'Neill both imagined that by merely making extraterrestrial greenhouses into a completely closed and fully-recycled system, humanity could live in outer space indefinitely and forever. Such a perspective sought to encapsulate an ecosystem. Thomas Jefferson's individual yeoman farmers would not maintain these greenhouses and through individual initiative and cultivation of their adopted acres create the American pastoral ideal. Instead, these greenhouses would be the extraterrestrial fulfillment of the centralized agricultural projects which characterize Communist and mega-capitalist agribusiness approaches to farming. In T.A. Heppenheimer's *Colonies in Space*, one full-page illustration of the interior of a cylindrical colonial farm tube depicts a series of large patchwork monocrops, plowed by powerful tractors, and lit by a sun behind glass. The visual effect is reminiscent of the view on an aerial journey over the American Midwest in spring except the land is curved along the inside of a cylinder, and is both above and below the observer.

Tsiolkovsky's particular enchantment with this vision of extraterrestrial greenhouses of light derived from his adoption of Federov's perspective on nature. Living in the famine-stricken Russia of the 1890s cemented in Federov the conviction that nature was not an organic whole, but "blind" and a "temporary enemy" until harnessed by mechanical man. "Man's place, in Federov," noted biographer George Young, "is not within but over nature." Russia, for the most part composed of flat and featureless landscapes stretched beneath a frequently cloudy sky was a land that, according to Federov, "does not draw the gaze earthward by its beauty."[424] Only by organizing the collective efforts of the masses, Federov believed, could savage nature be tamed forever to humane ends. Federov, born into the aristocracy himself, felt that his plan was the unspoken dream of the rural oppressed who would scientifically end the struggle against the elements if they were possessed of the power of the state. Those who admired the beauties of nature, he charged, were mostly members of his own romantic urban elite who had no understanding of the struggle against starvation waged by the peasant farmer.

Federov even connected the nascent technology of rocketry to his overall plan of the enslavement of nature for man. During the famines of the 1890s in Russia, he read various news accounts about supposed American successes in creating rainfall by the firing of cannons into the sky, and came to the bold conclusion that by turning these horizontally-aimed weapons of war into vertically-aimed rainmakers, catastrophes such as the drought plaguing his nation could be ended. The further development of such cloud-bound ballistics would eventually, in his view, be a piece in a larger puzzle of solving nature's blind debasement of humanity.[425]

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[424] Young, p. 118.
[425] Young, p. 114.

As George Young noted, Federovian ideas about the mastery of nature could be explained primarily as a factor of intellectually-based environmental determinism. "The insistence that we must all labor ceaselessly to control the savagery of nature," Young wrote, "might not have been expressed with such urgency had Federov grown up in, say, Tahiti."[426] Federov assumed himself champion of the rural masses, despite never lifting a hoe, and despite having little to no practical education in biology, agriculture, or ecology.

Gerard O'Neill, a native of New York City and an academic physicist, also possessed scant knowledge of ecology, despite couching his claims for the limitless expansion of humanity into space within a 1970s ecological and environmental aesthetic. His assumptions concerning the feasibility of completely closed-system agriculture, aquaculture, and animal husbandry derived from highly optimistic assertions that solutions to the complete encapsulation of an ecosystem could be easily achieved. In claiming that space colonization was imminently possible without any further advances in technology, O'Neill's assumption of the ease of closed-system ecology would be the first of his technological assumptions to be exposed as fallacious and wildly naïve.

Observations by contributors to the *CoEvolution Quarterly*, the first American publication to expose O'Neill's plan to open debate, frequently attacked O'Neill's assertions concerning the feasibility of closed-system agricultural self-sufficiency as ridiculous and totally unproven by practice. *CoEvolution Quarterly* Natural History editor and biologist Peter Warshall called O'Neill's idea a prime example of "contemporary American schizophrenia: a technological romanticism totally removed from agricultural practicality." Warshall admitted that the physics concepts involved were beyond him, "but O'Neill's understanding of plant growth leaves me totally uninterested

[426] Young, p. 118.

in the project."[427] John Todd, head of the New Alchemy Institute, an organization specifically devoted to developing self-contained and self-sufficient mini-ecosystems, claimed that

> [W]hen people talk of colonizing space they really don't have any genuine appreciation of what it will involve. All the present support for space comes from earth and until we learn much, much more about contained ecosystems, it will continue to do so.

Todd then proceeded to explain, in minute detail, how difficult it was for his Institute to even maintain the simple balance required of a self-perpetuating fish and algae experiment. In Todd's estimation, O'Neill's Island One colony "could support 40 people, not... 10,000."[428]

O'Neill's own 1975 Summer Study, 185 pages in length, devoted only eight short paragraphs to the subject of colonial life support. After beginning the section with the rhetorical questions, "What do the colonists eat and how do they obtain this food? What do they breathe? How do they deal with the industrial and organic wastes of a human community in space?" the report proceeded to provide not a single viable answer. While food and water supplies for a community of 10,000, the report stated, could be delivered from Earth at a cost of $7 billion per year, this would be far too expensive and would violate one of the central attractive features which had sold NASA's engineering establishment on the plan in the first place. Any closed-ecosystem, the authors noted, would have to be "unusually efficient" and thus require "advanced agricultural technologies." "Direct synthesis of necessary nutrients is one possibility," claimed the authors, "but such biosynthesis is not yet economically feasible." And while the colonists could perhaps consume mostly algae, the report admitted that not only would such a diet be unattractive to humans, but algae were "not outstandingly productive plants." Instead,

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[427]Peter Warshall, Letter, *CoEvolution Quarterly*. Spring 1976. p. 24.
[428]John Todd, Letter, *CoEvolution Quarterly*. Spring 1976. p. 21.

the report suggested that a more traditional diet consisting of "plants and meat-bearing animals" would be a better choice, but then cited not a single study in which the encapsulation of farming and ranching activities away from the vagaries of weather had even been proven to be successful. Instead, the report concentrated on the manner by which the colonists would recycle their waste, a relatively small achievement never before attempted by NASA even on the long-duration Skylab missions. While Clynes and Kline had suggested as early as 1960 in their paper introducing the concept of the "cyborg" that human waste be reshunted back into the astronaut's bloodstream, NASA had never successfully achieved full waste recycling.[429]

O'Neill's Summer Study report concluded that self-contained life support systems of agriculture and recycling – essentially the construction of an enclosed mini-Earth ecosystem in space – were far from feasible at the time, thus eviscerating the physicist's promises that such an achievement would be relatively simple. "While possible in theory," the report claimed, "large living systems have never been operated in a closed loop." In order to create such a system, it would have to first be tested on Earth. "First on a small scale, and finally on a large scale, complete closure of a demonstration life support system should be accomplished before colonization begins." To this day, such a system has never been proven to work effectively or efficiently.

In short, O'Neill's optimism about space-based agriculture and ecosystem maintenance was based on a single and simplistic observation about plants and people: they needed light and space was full of it. "Without sunshine," O'Neill observed, "children develop rickets, and without sunshine people tend to grow moody and

[429] The recycling of wastewater for human consumption was not seriously attempted in spaceflight until 1995 aboard the International Space Station, and the water was never consumed, even after being treated several times, because of high levels of organic and inorganic material remaining in the result. The experiment was part of the Lunar Mars Life Support Test Project, and was a failure. See http://lsda.jsc.nasa.gov/, Water Chemistry Monitoring experiment (LMLSTP4.2)

depressed: almost surely the high suicide rate characteristic of the Scandinavian nations is, at least in part, connected to cloudy skies and long cold winters."[430] The abundance of light in space, O'Neill suggested, could free those denizens of the Great White North into spacebound Tahitis of agricultural abundance, in much the same way Federov and Tsiolkovsky hoped that the vertical ascension of rockets and cannonballs could release their ilk from the drab Russian winters and force the clouds to give forth a life-giving rain to water a mindless and occasionally fruitless land. Endless streams of vital sunlight would bathe the colonists to whatever glow they desired, merely by altering the day-length through the use of an enormous aluminum-foil shade. Humanity, by entombing themselves in a mirrored and windowed cylinder in heaven, would become as if glowing angels, or as Cotton Mather exclaimed in imagining the appearance of the raptured elect, "Luminous Bodies!"

But this dream, too, began to dim as O'Neill's dreams were further exposed to the light of day. The primary colonial vision, that of a freed humanity forever bathed in the fullness of a "day" of chosen length, would die in the subsequent 1977 Summer Study on space colonization funded by NASA. Embedded in this report, safely distanced from the rosy and optimistic rhetoric of the conclusions, and protected from criticism by the inarguable assertion that such troubles would be solved through the further outlay of funding and the attendant conduction of research, was the recognition that the only way by which space-based habitation on an O'Neillian scale could be accomplished would be through an almost complete cutting off of the inhabitants from the natural lights of the celestial firmament.

In the only one of sixteen chapters devoted specifically to the construction and feasibility of the space habitats, "Effect of Environmental Parameters on Habitat

[430] *HF*, p. 48.

Structural Weight and Cost," the three co-authors attempted to quantify the various price tags involved in making the colonial living conditions as physiologically "Earth-normal" as possible. Recognizing that making a colony "Earth-normal" could prove prohibitively expensive, the chapter compared what they called "conservative" Earth-normal habitat designs with those that fudged the physiological requirements a bit – requirements such as atmospheric pressure, cosmic radiation exposure, gravity, and light.

For atmospheric pressure requirements, the authors found that while pure oxygen would create the cheapest breathable atmosphere, it would create a significant fire danger, evidenced by the deaths of three American astronauts in an explosion under such conditions during Apollo 1 simulations in 1967. By reducing the atmospheric pressure, money could be saved, but this would result in other problems such as those experienced by the Skylab astronauts, who lived in atmospheric pressures one-third of Earth normal. The astronauts reported that they could only hear each other if five inches away from their communicant and this "often left them hoarse." An inert gas such as nitrogen or helium could be pumped into the habitat, but this would also result in not insignificant difficulties. Nitrogen might give colonists the bends, and helium might leave the colonists with "serious voice distortion": they would sound like Donald Duck. Further studies were recommended.[431]

As for gravity, the chapter was very brief on recommendations, except to note that despite the disorientation attendant via the Coriolis effect, a rotation rate of 3 rpm would be suitable for a 100-person colony of specially selected individuals. A rate of 2 rpm for larger colonies would exhibit significant considerable cost savings, despite the still significant problem of the Coriolis effect. Further studies were recommended.[432]

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[431] John Billingham and William Gilbreath. *Space Resources and Space Settlements*. NASA SP-428. Washington, D.C.: NASA, 1979. online at http://lifesci3.arc.nasa.gov/SpaceSettlement/spaceres/II-1.html.
[432] *Space Resources and Space Settlements*, http://lifesci3.arc.nasa.gov/SpaceSettlement/spaceres/II-1.html.

Cosmic radiation exposure in space is significant and a dire threat to colonists planning on spending the the rest of their lives off of the planet. The chapter recommended extensive shielding for the habitat, but based all of their shielding assumptions on a yearly radiation dose for each inhabitant of 5 rem per year. Despite the fact that this was the U.S. standard for radiation workers and not the general population, who were expected to only receive 0.5 rem per year, the authors considered colonists as radiation workers because they assumed that the first colonists in the 100 to 10000 person habitats would only live in space for short to intermediate periods, which they defined as between one and thirty years. While massive twenty-year solar flares could bombard the colony with a single mega-dose of radiation on the level of 25 rem at one time, the authors calmed the fears of the readers by noting that the early colonists would most likely not be in space long enough to experience such an event. According to NASA's current Space Radiation Analysis Group, astronauts are all currently classified as radiation workers, because "terrestrial radiation guidelines are considered too restrictive for space activities."[433] Current radiation exposure levels for the visceral organs of astronauts are 25 rem per month or 50 rem per year. While the acceptable radiation levels for astronauts over the course of their career are currently 150 rem for men and 100 rem for women, the Johnson Space Center notes on their website that based on a recent "reevaluation of atomic bomb survivor data… even lower career limits for astronauts may be warranted."[434] Exposure at the current levels, notes NASA based on the older data, would result in 3% of the astronauts dying of cancer due to radiation exposure. In 1972, a solar flare which occurred between the Apollo 16 and Apollo 17 missions would have exposed the unshielded astronauts to 20,000 rem in a 14-hour period. According to

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[433] "Why is space radiation an important concern for human spaceflight?" Space Radiation Analysis Group, NASA Johnson Space Center Website. http://srag.jsc.nasa.gov/AboutSRAG/Why/Why.htm. Accessed June 30, 2004.
[434] Ibid.

the Mars Institute, if such a flare had occurred during either of the two missions, "the astronauts would have been incapacitated immediately and dead within hours or days."[435] Provided with only a fraction of the current knowledge surrounding the enormous hazards of long duration spaceflight, much less habitation, the authors recommended that because of the enormous cost of transporting heavy radiation shielding from Earth, the materials for such shielding be "obtained from processed lunar soil."[436] No further studies were recommended regarding acceptable radiation doses for space colonists.

However, the radiation shielding posed a significant problem in another area of habitat livability. Too much shielding would result in the almost complete blockage of natural sunlight from reaching the proposed extraterrestrial California within. Sagely noting that "[t]he most important component of man's sensory apparatus is his visual system," the authors recognized that space colonists would need "proper lighting in their work, rest, and living areas." This recognition was prompted by "[o]ne of the largest habitability problems aboard Skylab" which was the unfortunate fact that "the lighting was so poor the astronauts were unable to read a book."[437]

The authors analyzed various lighting requirements for a 10,000 person habitat consisting of colonial residences, shops, offices, schools, hospitals, auditoriums, recreational facilities, public spaces, service industries, transportation devices, mechanical subsystems, and agricultural areas. The necessary llumination could be achieved through either naturally admitted sunlight or through artificial lighting. However, the authors observed, the "natural illumination choice is probably reasonable only for larger habitats," so their analysis was restricted to a cost comparison of natural

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[435] Abstract for *Lunar Storm Shelter Conceptual Design*, EEI Report #88-189, Eagle Engineering, May 1, 1988; report prepared for the Lunar Base Systems Study, NASA Johnson Space Center, Houston, Texas. At Mars Institute Website. http://www.marsinstitute.info/rd/faculty/dportree/rtr/hu08.html.
[436] *Space Resources and Space Settlements*, http://lifesci3.arc.nasa.gov/SpaceSettlement/spaceres/II-1.html.
[437] Ibid.

versus artificial lighting within a "10,000-person spherical habitat." They used this habitat configuration even though the NASA-funded study two years earlier had found spherical habitats impractical and costly.

Furthermore, the contributors to the chapter noted that if the cost of the colony was not to balloon wildly out of control, and if meteorites were not to puncture the habitat and result in depressurization and death, the weight of the light-admitting windows would have to be reduced. They suggested that this be done by reducing the window area, thus increasing the amount of metal in the spherical habitat sky, and by positioning large swiveling mirrors to concentrate sunlight instead of admitting it directly. Already the colony sky began to disappear.

However, radiation shielding posed a distinct problem for the remaining windows. While the windows could be made quite thick, and thus double as shielding, this would be prohibitively expensive, raising the cost of the windows by 20 times. An alternate approach would be to use chevron windows, with pyramidal peaks, protected with shielding "constructed from lunar slag." While this style of window would require twice as much shielding -- which would in turn have to be mined, launched, and manufactured off of the moon – it would still be less expensive than the flat glass windows originally envisioned by O'Neill.

In the end, the authors found that natural illumination for the already impractical 10,000 person spherical habitat would be more cost effective than artificial illumination. However, such natural illumination would have to be concentrated via mirrors rather than directly delivered, thick windows doubling as shielding would be "expensive and impractical" so the windows would have to be shaped like chevrons, thus preventing uninterrupted views of the universe, and "[n]atural illumination should also be considered

for living/working areas unless distribution becomes awkward or expensive."[438] While the authors did not specifically state this, if distribution did become awkward or expensive, as it had already proved to be in the previous analysis, then artificial illumination would have to be used.

While the authors concurred that O'Neill's Bernal sphere would, as the physicist claimed, be easily lit through natural illumination, such a habitat configuration would be the most expensive of those studied – by a lot. The authors did not study illumination distribution in the other two habitats considered – the Stanford Torus and O'Neill's new brainchild, the "Crystal Palace" -- perhaps because they had, even before embarking on their analysis, come to see such distribution, as they noted briefly in the conclusion, as "cumbersome" and fraught with "difficulties." The authors recommended the construction of no specific habitat configuration and instead recommended further study. However, they concluded that given all the factors considered, each design would, in the end, be just as ridiculously expensive to construct, just as replete with unknowns and assumptions concerning the feasibility of mining the moon, and just as prone to disaster as any other. The only practical habitat one could see constructed from the authors' maze of alternating assumptions, cross-referenced recommendations, and confusing qualifications about lack of evidence, was a small, windowless space station of maybe 100 people.

The crowning justification for O'Neill's vision – the release of humanity into an interior Earth of endless California sunlight – darkened just as his dreams of colonial health and flight in low gravity crashed. The entire project was completely unworkable, and as this began to dawn on those in NASA who had publicly supported the physicist's conclusions before even bothering to question its feasibility or O'Neill's credibility, the

[438] Ibid.

agency moved swiftly to cut off all funding from O'Neill and for his project. There would be no mile-long windows through which the Earth eclipsed a blood-red moon; the colonists would not bathe in the glow of endless summer, but more likely in the headache-inducing glare of humming fluorescents; and the lack of a cosmic view would turn O'Neill's colonies into the self-contained, hollow, and windowless Bernallian sphere he had attempted to reconstruct for an Earth-appreciative postmodern American citizenry. The metal shell of the colony would have to be all-encompassing, turning the space colony into nothing more than a humongous space station, sealed in against itself and the universe its chosen colonists were supposedly eager to explore. At best, O'Neill's vision would resemble the Death Star. The extraterrestrial greenhouse of paradaisical life became an entombing extraterrestrial submarine with no need of the sun, or the moon, to shine in it. With the findings of the 1977 Summer Study, NASA cut off O'Neill's funding forever, lest his vision continue to discredit an already limping agency and illuminate the hard and depressing fact that it, too, was always based on a faith, trumpeted mainly to conceal its true purpose as a spectacularly distracting sideshow from the manufacture of the apocalyptic weapons of mass death.

## 13: Our Society Will Split This Way: The Spacebound Elect and the Earthbound Damned

The idea that humanity would split into two separate species as a result of space colonization, as we have seen, closely resembled the Christian rapture division of the elect from the damned during the End-Times. Both visions anticipate a risen, superior humanity departing a doomed Earth for a position of deserved lordship in the sky. Tsiolkovsky anticipated this division and speciation with bliss. His mentor Federov, like so many philosophers of his day, adhered to a racialist perspective on human destiny. Like the Nazi ideology which would arise in Germany decades later, Federov believed that the Slavs were the Earth's most superior breed, and destined to control the future of the Earth and the cosmos.[439] Tsiolkovsky's attention to extraterrestrial speciation reveals a similar ideology concerning evolution and humanity. Arthur C. Clarke's prediction that machines would be the future progeny of mankind was merely a short step from believing the space future was flesh-based to a space future as silicon-based. Machines, in Clarke's opinion, were the superior and noble extraterrestrial heirs to mankind's legacy.

On the eve of the Apollo 11 moon landing, the American public was sharply divided on the worth of the space effort. CBS News Correspondent Eric Sevareid described succinctly the national division in regard to the moon endeavor. Of those who supported the moon missions, Sevareid called them men "passionately convinced that we cannot plan our opportunities but must take them at the tide when they come, that without new frontiers always beckoning, an energetic people rusts and corrodes, that space is not only the cutting edge for science today but a moral substitute for war that could give the

[439] See George M. Young, Jr. *Nikolai F. Federov: An Introduction*. Belmont, Mass.: Nordland Publishing Company, 1979.

quarreling human race some sense of common identity, of brotherhood." On the other side, maintained Sevareid, were "men convinced with equal passion that this adventure, however majestic its drama, is only one more act of escape, that it is man once again running away from himself and his real needs, that we are approaching the bright side of the moon with the dark side of ourselves, with chauvinism, competitive agression, and that the chief uses of space will be military in the end." He was very clear about the conceptual gulf he felt lay between the two groups. "The core of the argument is philosophical, almost religious," he observed.[440]

Transcipts of the CBS newscasts surrounding the lunar landing chronicle the opposing viewpoints on space in 1969. Arthur C. Clarke told CBS anchor Walter Cronkite that he hoped "that this great lifting of the spirit which we've all experienced today will make a change in morale and help this country get away from the defeatism of the past." Science fiction author Robert Heinlein concurred, blaming America's youth for the desultory response to what he called "the great day." "There have been too many of the young people in this country who have the defeatist attitude toward things and I hope that this will give them the "lift," the "esprit de corps," to realize how terribly important this is… This is it." Ray Bradbury gave voice to the exo-millennial ideology when he told Mike Wallace that "by the end of the century our churches will be full again....[b]ecause of space travel" and that "we are God himself coming awake in the universe." A life confined to Earth, Bradbury claimed, was no life at all. "[I]f we stay here on earth, we are all of us doomed, because someday the sun will either explode or go out. So in order to insure the entire race existing a million years from today, a billion years from today, we're going to take our seed out into space and we're going to plant it

[440]CBS News. *10:56:20 PM EDT 7/20/69: The historic conquest of the moon as reported to the American people by CBS News over the CBS Television Network.* CBS, 1970. pp. 10-11

on other worlds. And then we won't have to ask ourselves the question of death ever again..."[441]

Other voices on the broadcast were less optimistic. Activist Gloria Steinem took her turn in front of the cameras to mention the ongoing war in Vietnam. For Steinem, the "conquest" of the moon conjured up the images of another era, when a Christianity-inspired wave of exploration resulted in the deaths of millions from the effects of war, slavery, and smallpox. Steinem found it "hard to get enthusiastic" about the moon landing. "[I]t's as if we're getting more and more like fifteenth-Century Spain."

> We're discovering a new world but I wonder if we don't have our own Inquisition going in Vietnam in the name of that great religion of anticommunism. I'm sure we've napalmed many thousands more people than the Spanish ever burnt at the stake.[442]

Ira Magaziner, then a student activist and later an aide to President Clinton, expanded on Steinem's comments, putting an environmental spin on them: "[W]hile we're patting ourselves on the back about our great technology... I can't help but think about the air pollution and water pollution which have resulted from the technology on earth.

> ...I can't get very excited about all the money we spent...when we really don't even blink that much of an eye about a million people being killed in Biafra.[443]

Kurt Vonnegut's assessment of the situation, however, would perhaps best describe the fervency with which the "defeatist" youth believed in their anti-technocratic cause. Echoing the quasi-religious futuristic musings of H.G. Wells and J.D. Bernal, Vonnegut predicted that American culture, as a result of the space program, would split into two constituencies.

"One thing that came true last night was a prophecy of H.G. Wells," he claimed.

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[441]Ibid. pp. 119-20.
[442]Ibid, p. 67.
[443]Ibid. p. 67.

> In *The Time Machine* he predicts a time when human society will split into two distinct sorts. The basically poetic sort and the engineering types. Finally, the engineers become dominant. You could see this last night. Mr. Cronkite, for instance, at the time Armstrong put his foot on the moon said, "I wonder what the cynical kids are saying about this?" And this morning there was much talk about what the cynics are saying. Well, what is happening is that these are not cynics. These are different sorts of people from the engineers, and our society will split this way...[444]

Vonnegut's reversal of the exo-millennialist prediction of ascension, with or without the bulk of humanity, expressed well the growing gulf in American society. Instead of trying to argue with the proponents of technocracy, whose worldview was fundamentally antithetical to theirs, Vonnegut and his earthly friends would merely split off and become a separate society, and perhaps even, over time, a separate species. If the engineers were becoming "dominant" and "higher," perhaps they would go so high they would never come back.

Since the late 1960s, NASA officials had been searching for a way to spread their exo-millennial philosophy to the anti-establishment youth culture. NASA continually tried to appeal to a generation distrustful of technocracy and high technology, and bored with manned spaceflight. Without the future leaders of the nation behind the agency, there would be no agency. American society, in the 1960s, had split in many different ways – between fundamentalist Christians and ecumenical liberals, between hawks and doves, between one generation and the next, between environmentalists and technocrats, between Earth and Space. For NASA, the split between Earth and Space would smart the most. Failing to inspire half of the American public to support the exo-millennial promise of manned spaceflight could mean the death of the agency. Although NASA's opponents would come from a variety of constituencies, ranging from poor blacks to environmentalists to clergymen to skeptical businessmen, the agency's hierarchy most

[444]Ibid. p. 123.

often imagined that those who opposed their dream were largely composed of an intransigent and pampered youth dismissive of the promise offered to their children by the glory of spaceflight and humanity's move into the universe. Throughout the Apollo missions, such oppositional youth were branded "defeatist," "ignorant," "naïve," and unpatriotic. Such criticisms by NASA officials often echoed those aimed at anti-war activists by the American military. But NASA's goal, and the degree to which they felt the future of humanity rode on the continuance of the move into space, made the perceived stakes for the agency much higher than those in a small war halfway across the Earth. Winning over, or countering forever, this oppositional movement became a project of millennial proportions.

O'Neill's colonies offered the hope of creating a broad-based, progressive constituency behind manned spaceflight, at the very moment in time that NASA's star seemed as if it would blink below the American horizon forever. Budgets were tight, and the Executive and Legislative Branches of the U.S. Government were more skeptical than ever of the worth of the entire civilian agency. If the agency could appeal directly to the American people, and help stoke a grassroots movement behind spaceflight, the exo-millennial vision could perhaps be resurrected and save spaceflight.

However, NASA had a logistics problem. The spaceflight fantasy had involved, since its first stirrings in seventeenth century England, the division of humanity between a spacebound raptured elect and a "left behind" Earthbound heathen. Vonnegut had predicted that this Wellsian split was the very gulf NASA now attempted to bridge. Could the space vision be sold to a constituency that identified strongly with the Earth? Could NASA convince those of the Earth that migration into space paradoxically held the key to their own survival? Could space exodus be characterized as anything less than a rejection of the planet?

O'Neill's plan for space colonization, seemingly balanced between appeasing the spacebound and the Earthbound simultaneously, created a theological rift of its own. In 1974, the POINT Foundation, its endowment supplied by sales of the *Whole Earth Catalog* and its successors, would fund the space colony conference which introduced O'Neill's ideas to the world. The following year, the *CoEvolution Quarterly (CQ),* the monthly sequel to the haphazardly published *Catalogs*, led by editor Stewart Brand, advocated the immediate construction of space colonies claiming that they promised to solve "the Energy Crisis, the Food Crisis, the Arms Race, the Population Problem, and maybe even the Climatic Shift."[445] The issue announcing *CQ*'s support for space colonization announced boldly on its front cover, ""O'Neill's Space Colonies, Practical, Desirable, Profitable, Ready in 15 Years."[446]

The encounter of the readers of the *CoEvolution Quarterly* with space colonization would result in what remains today perhaps the most cogent, fruitful, and fascinating public debate over the merits of manned spaceflight, space colonization, and space industrialization ever published. In a series of *CoEvolution Quarterly* issues, readers, opinion leaders, scientists, artists, architects, NASA officials, and space colonization advocates debated the merits of O'Neill's plan and through this debate, the concept received its first sustained and often withering criticism. Some of the criticisms of O'Neill's plan were philosophical but many of them were also technical. By examining these debates, one can see the clash of the children of the Space Age and the children of the Earth Age and perhaps an intimation of the future split in the human species prophesied by H.G. Wells, J.D. Bernal, and Arthur C. Clarke. In the end, *CQ's* readers

[445] Brand, "The sky starts at your feet," in *Space Colonies*, pp. ~~6~~ 7.
[446] Cover, *CoEvolution Quarterly*, Fall 1975.

and most of its contributors would reject O'Neill's plan, often quite passionately, and the debate would leave a schism from which the publication would never heal.

For NASA and space colonization advocates, this rejection would only confirm the truth of previous predictions. The rapture would not be for everyone. Some would choose, ideologically, to stay behind on an Earth in the midst of Tribulation. After this confirmation, space advocates would never look back to seek support among the Earthbound, but instead come to see the militarization of space as the only sure route to the millennial transcendence they sought.

## THE COUNTERCULTURE, THE EARTH, AND THE SKY

*CQ* and *The Whole Earth Catalog*, perhaps more than any other periodicals of the 1960s and 1970s, were identified with the American counterculture. The *Whole Earth Catalog* had always been identified, in turn, with the NASA-generated photograph of the Earth which appeared on the cover of every edition. The "counterculture," however one defines it, came of age in the era when space first became imagined as a possible frontier, a land, and a home. For this group, the encounter with what had become a broadly perceived imminent human emergence into an extraterrestrial environment became a pervasive, energizing, and perhaps fundamental force. The counterculture was all-too-aware that the occurrences in the region known to their ancestors as heaven were unique and possibly life-altering. The fact that something unparalleled in human history was almost always happening above their heads could not help but leave a deep impression upon not only their view of the cosmos and the Earth, but also upon themselves and their role at the spiritual vanguard of the future.

The *WEC* had the reputation of being a quirky, irreverent, and useful resource, designed to help alienated baby boomers obtain simple tools, guides, and kits, necessary

for the construction of a presumably more independent, self-sufficient existence. The "Purpose" of the catalog, as posted on the inside cover of the first issue in 1968, began by stating that "We <u>are</u> as gods and might as well get used to it.

> So far, remotely done power and glory – as via government, big business, formal education, church – has succeeded to the point where gross obscure actual gains. In response to this dilemma and to these gains a realm of intimate, personal power is developing – power of the individual to conduct his own education, find his own inspiration, shape his own environment, and share his adventure with whoever is interested. Tools that aid this process are sought and promoted by the WHOLE EARTH CATALOG.[447]

The catalog quickly became a fixture in homes across the nation, an easily recognizable badge of countercultural identification. Endlessly perusable, often amusing, and occasionally useful, the catalog was the counterculture's answer to an earlier generation's Sears Roebuck.

The catalog grew from the inspiration of a San Francisco psychedelic pilgrim and former Army officer, Stewart Brand. A graduate of the elite New Hampshire prep school, Phillips Exeter, and Stanford University, Brand was an early pioneer in the psychedelic movement. In 1962, Brand participated in a LSD research study at the International Foundation for Advanced Study in Menlo Park, California, and between 1963 and 1966, he became involved in photographing and raising awareness of the United States's Hopi, Papago, and Navajo Indians. By 1964, he was a fixture at the acid "tests" thrown by Ken Kesey's band of Merry Pranksters.

But it was in 1966 that the genesis of the Whole Earth Catalog emerged. In March of that year, two months after organizing a three-day "Trips Festival" in San Francisco, Brand sat on a Haight-Ashbury rooftop, looking at the long horizon, his vision and senses heightened and sharpened by a tab of acid he had ingested an hour earlier. He saw, or imagined he could see, the curvature of the Earth all around. The Earth was a

[447] *Whole Earth Catalog*, Fall 1968. Inside front cover.

sphere, and for Brand this brief realization sparked in him a simple but nagging question. The United States and the Soviet Union had been launching unmanned probes into deep space since as far back as 1959 in attempts to study the Sun, the moon, Mars and Venus. While relatively simple machines by today's standards, many of these probes carried cameras designed to provide close-up images of Earth's neighbors. However, to Brand's knowledge, not a single photograph of the Earth, taken from a far-enough distance from the surface to encapsulate the entire sphere had ever been disseminated by NASA or any other space agency. This omission struck Brand as odd and even somewhat suspicious. Surely it would not be difficult to take a photograph of the Earth from the orbit of the moon, if camera-ready probes had been fired at the Earth's closest neighbor since 1959. "It was a bit odd that for ten years, with all the photographic apparatus in the world," Brand recalled later, about his 1966 campaign, "we hadn't turned the cameras that 180 degrees to look back. We had designed beautiful cameras, but no mirrors. Rather strange."[448]

The mischievous and creative Brand hatched a curious grassroots campaign as a result of his unanswered question. He printed a batch of buttons, emblazoned with his acid-inspired question: "WHY HAVEN'T WE SEEN A PHOTOGRAPH OF THE WHOLE EARTH YET?" He positioned himself outside Stanford's Sather Gate, distributed the buttons to passersby, and, as was frequently the case with Brand, attracted a great deal of attention. The slogan was simple, hinted at a vague conspiracy involving NASA, and intimated that there might be something in the image of the Earth from afar which could upset the present order and perhaps usher in a new age. Brand's brief

[448]Stewart Brand, "The First Whole Earth Photograph," in *Earth's Answer: Explorations of Planetary Culture at the Lindisfarne Conferences*, Michael Katz, William P. Marsh, and Gail Gordon Thompson, eds., Harper & Row: New York, 1977. p. 187.

inspiration soon began to take him in a direction he could never have previously imagined.

Two years later Brand published the first-ever *Whole Earth Catalog*. A scarce photograph of the Earth as seen from space appeared on the front cover. The space program, and the metaphors hatched by that program, had begun to create dividends NASA never could have dreamed of.

When Gerard O'Neill approached the POINT Foundation in 1974 with his idea for a space colony conference, he had stumbled upon a grant organization which had as its three-word motto, "Access to tools," and which held the respect and admiration of a sizable contingent of the 1960s counterculture. The sales of the *Whole Earth Catalog* which funded POINT came from a portion of U.S. society which held both a culturally progressive outlook and a wary, but not inimical, perspective on technological progress.

Stewart Brand quickly became the most enthusiastic countercultural ambassador for space colonies. For Brand, O'Neill's idea offered the hope that the space program could be resurrected in a more socially active and conscious incarnation through space colonization. "Suddenly [people] can see Space as a path, or at least a metaphor, for their own liberation," wrote Brand.[449] Brand saw space colonies as a technical solution to technical despair.

Brand was mildly interested in O'Neill's idea when he attended the World Future Society convocation in Washington, D.C. in the spring of 1975. According to Brand, O'Neill's talk "was perhaps the least well-attended of the hundred presentations at the conference," a fact he attributed to his suspicion that "[f]uturists were more interested in

[449] Stewart Brand, "The sky starts at your feet," in *Space Colonies*. p. 5.

problems than solutions that year." In the audience at O'Neill's speech, Brand felt his "mild interest" turn into "obsession."[450]

In the Fall 1975 issue of the *CoEvolution Quarterly*, Brand revealed to his countercultural readership his new passion and his new dream for the future. In Brand's customary introductory letter, which he had grown accustomed to titling "Apocalypse Juggernaut, hello," the *Whole Earth Catalog* creator began with the query, "Apocalypse Juggernaut, goodbye?" In the letter, Brand wrote:

> My own conviction is that both the idea and the reality of Space Colonies serve the realization of cultural/biological balance on Earth – exactly as the photographs of Earth from Space served the Ecology Movement. Space is part of the wildness in which lies "the preservation of the world."[451]

Stewart Brand was so high on O'Neill's idea that he called space colonies "readily possible – maybe inevitable – by 2000 A.D."[452] In his introductory essay Brand seemed most enamored of the recreational possibilities, speaking at length about the low gravity swimming pools, ease of flight, and kayaking on a circular space colony river. He also touted the "intellectual ferment" which would occur through space colonization, a parallel he drew from the European/American colonization experience. "New lands meant new possibilities; new possibilities meant new ideas," gushed Brand. "If you can try things, you think up things to try." Brand, although a member of a counterculture highly wary of colonization, given the then volatile struggles for self-determination in Africa, Asia, and South America, saw no problem with movement into space. "[T]here are some important distinctions from the experience of colonizing North America," Brand noted. "One is the

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[450] Stewart Brand, *Space Colonies*, p. 8
[451] Stewart Brand. "Free space," in *CoEvolution Quarterly* Fall 1975. p. 5.
[452] Brand, "Free space," p. 4.

absence of natives – no conquering, no exploitation, no guilt this time." He also made the claim that "[w]arfare in general might be obsolete in Space."[453]

Brand invited readers to submit their comments on the idea, and specifically asked "a number of notable people" to comment on it. In addition, he included a short questionnaire in the back of the magazine. "The CQ is in cahoots with O'Neill and company," the quarter-page cutout read. "We'll be pursuing the subject of Space Colonies in future issues. Best we find out now where you are about it all."[454]

The results of Brand's informal solicitation were published in the Spring 1976 issue of CQ. He counted 170 respondents among the readers at large, of which 122 thought it was a 'good idea,' 20 weren't sure, and 28 thought it was a 'bad idea.' Brand found the response heartening, given CQ's circulation, and was further encouraged that most of the 122 approvals came from college students. However, beneath Brand's positive spin on the responses lay a troubling undercurrent of sharp disapproval. Brand had received 44 additional responses from invited "notable people" and of these, nearly half (21) thought it was a 'bad idea' and only 17 thought it was a 'good idea.' Six others weren't sure. Brand admitted that some of the responses unsettled him and suggested the particularly sharp criticisms were unexpected. "Something about O'Neill's dream has cut deep," he wrote. "Nothing we've run in The CQ has brought so much response or opinions so fierce and unpredictable and at times ambivalent." [455]

Support for the idea came largely from scientists, engineers, politicians, and artists. A common response from supporters was to characterize space colonies as children with the Earth as the mother. The Earth was pregnant with man and the troubles

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[453]Ibid, p. 5

[454]"Space colonies questionnaire," in *CoEvolution Quarterly*. Fall 1975. p. 142.

[455] Stewart Brand, in "Comments on O'Neill's Space Colonies: Is Balance Really Possible Where Even Gravity is Manufactured?" in *Space Colonies*. p. 33.

of the era were a form of labor, and the planet had to give birth or die. Brand's spiritual mentor, R. Buckminster Fuller, felt that space colonies were "just as normal as a child coming out of its mother's womb, gradually learning to stand, then running around on its own legs." He felt that the enlightened would support the project. "To all who are living in cosmic realism, the immediate inauguration of additional Earth-Moon, around-the-Sun flying formations of our team could not be more humanly normal," wrote Fuller.[456] Apollo 9 astronaut Russell Schweickart used a similar procreation metaphor in his support for the idea, and lavished praise on O'Neill for being a visionary obstetrician. "Gerry O'Neill is my hero. At a time when hair-shirting is the style and immediate utility the password to success, O'Neill dares to open the door again to man's destiny...

> Many of us, on returning home from space, brought back the perspective of a lonely and beautiful planet crying out for a more responsible attitude from its most prolific partner...[N]ow, mother earth need no longer remain barren and generations of diverse offspring can continue to ask why.[457]

On the other hand, several of the positive responses had a decidedly Christian flavor, and were filled with insinuations that space might actually be a form of heaven. Gurney Norman, a regular contributor of fiction to *CQ*, saw the "main use of space colonies as religious" and thought they should be built "not as industrial enterprise, but in the spirit of the old Cathedrals, like Canterbury." While Norman admitted that in his head, "I'm against all this space stuff," in his heart, he wanted to go. "I want to get to heaven, by hook or crook."[458]

Brother David Steindl-Rast, a Benedictine monk, and associate of Brand's, was particularly enthusiastic. "You've done it again! If the publicity you are giving to O'Neill's idea of space colonies catches on," he predicted, "it could have an impact

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[456]R. Buckminster Fuller, Letter, *CoEvolution Quarterly*, Spring 1976. p. 29.
[457]Russell Schweickart, Letter, *CoEvolution Quarterly*, Spring 1976. p. 6.
[458]Gurney Norman, Letter, *Space Colonies*, p. 69.

comparable to those first photographs of Earth from Space. Isn't it fascinating how quickly we moved from recognizing our planet as 'Spaceship Earth' to designing an Earth Spaceship?" Brother Steindl-Rast recognized in space colonies the fulfillment of the monastic ideal. "[M]onks ought to be able to teach us something in preparation for space colonizing," he surmised. "They have for quite a while experimented with intentional, often self-contained communities, and with the creative tension between cenobitic (communal) and eremitical (solitary) life."

Steindl-Rast thought that space colonies would entail "limitations of a kind we never come to know on earth," and thought that because "every limitation points to our ultimate limitation, to death," all aboard the colony would experience the hermit's "radical confrontation with death." The monk felt that he could easily round up "a starter group of space hermits" from his brethren. "What a rallying point space colonizing could be for our whole human family!" he exclaimed, and then suggested that Brand and he make "as much noise about space colonies" as possible. Reflecting that Columbus could have used more publicity for his voyage, Steindl-Rast noted that the Italian explorer spent seven years mustering support. The monk ended his approving letter on an apocalyptic note. "We can't afford seven years in 1976!" In essence, Steindl-Rast saw space colonies as an interior heaven for ascetics, that needed to be created immediately lest the apocalypse arrive first.[459]

Italian-American architect Paolo Soleri submitted a very long and obtuse meditation on space colonization also packed with Christian overtones and he also saw O'Neill's plan as a harbinger of a future split in the species. Then involved, as now, with the construction of Arcosanti, a visionary, self-contained 5000-7000 person community in the Arizona desert, Soleri believed that space colonization was not a technological,

[459] Brother David Steindl-Rast, Letter, *Space Colonies*, p. 50.

political, or economic problem, "but a theological one." Soleri proceeded to examine the "eschatological implications of space colonization," and divided his analysis into three parts: "the eschatological concern," "the genetic concern," and the "urban concern." Of the eschatological concern, Soleri felt that it was the destiny of man to be free of the planet. The "space city" would be a step towards "logos" and "intellection." "It would then be for the sake of logos that life must free itself from the 'earthly prison,'" he concluded. "And if it is possible for life to free itself from the earth, isn't it then a 'mortal sin' not to do so?"

Of the genetic concern, Soleri predicted that "the most momentous outcomes of space colonization" would be "the appearance of human mutants." Inevitably, Soleri saw the human gene pool as "fractionalized," perhaps into three levels, which he dubbed "living fossils (the earthlings?), psycho-techno man (cyber), superman (an intellect-relayed multitude constituting a single creature?)" He felt that humanity should not be frightened of this genetic fractionalization because space exploration could result in "encounters with other centers of consciousness and grace" and that opening the way into space could lead to "the possibly infinite radiance of the future…"

Of the urban concern, the architect claimed that urbanity was an "eschatological imperative." Insects, Soleri felt, in their common union for a single purpose, formed collective entities with as much intelligence as a human and were the epitome of urbanity. Taking his cue from ants, Soleri thought that the "Urban Effect" was a "universal concern, the rule and not the exception" and that the "urban imperative" would cause "not so much the City of God but instead… the God-City, the Omega Urbis et Orbis…" The architect believed that it might be necessary to reimagine God Himself in humanity's thrust into space. "It might indeed by indispensable that our anthropomorphic god be reinvented into the God in the likeness of the city…" Space colonies, for Soleri,

would be God-heavens within which genetically mutated humans would collectively work for the good of the whole, like termite colonies. Hierarchy would be absolute, since all would be equal, except for the all-encompassing Aristotleian God-City orb surrounding the workers.[460]

A few supporters based their approval on the promised environmental salvation afforded by O'Neill's colonies. However, environmentalist support on the whole was quite slim, and when it did appear came from either green politicians or environmentalists specifically concerned with over-population. Perhaps the most surprising support would come from *Population Bomb* author Paul Ehrlich and his wife Anne. Despite claiming in *The Population Bomb* that large-scale space colonization would never be able make a dent in the population problem, Paul had seemingly mellowed out a bit, perhaps because his predictions of imminent global starvation and collapse had so far not materialized. "The possible advantages of the venture are many and not to be taken lightly," Paul and Anne, writing together, recommended. "In theory many of the humanity's most environmentally destructive activities could be removed from the ecosphere entirely." The Ehrlichs claimed O'Neill's colonies should naturally appeal to environmentalists, because they offered

> a high quality environment for all peoples, a relatively depopulated Earth in which a vast diverstiy of other organisms thrive in a non-polluted environment with much wilderness, a wide range of options for individuals, and perhaps time to consider those philosophical questions.[461]

The Ehrlichs warned their fellow environmentalists not to take "too short-term a view of the human predicament." O'Neill's proposal should not be "prematurely" rejected by the environmental community to which it was designed to appeal, they said.

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[460] Paolo Soleri, Letter, *Space Colonies*, pp. 56-60.
[461] Paul and Anne Ehrlich, Letter, *CoEvolution Quarterly*. Spring 1976. p. 14.

Another source of support would be from the Space Age psychedelic granddaddy of the counterculture, Timothy Leary himself. Leary's support for space colonization would not appear in the *CoEvolution Quarterly*, even though Leary became as fervent a popularizer for the idea as O'Neill and Brand. The physicist, not surprisingly, generally tried to avoid being associated with the psychedelic pioneer. Leary was a huge fan of O'Neill's ideas, however, describing the physicist's recognition that colonies would "create an enormous plurality of culture-styles and moral systems," the mark of an "anthropological genius."[462] "I consider Gerard O'Neill to be the most important human being alive today," Leary said in 1977, "and possibly one of the most important and intelligent human beings ever to live."[463]

Leary's interest in space colonization began before O'Neill's plan went public. In a California jail in 1973 for both marijuana possession and for escaping from prison and fleeing to Algeria, Leary wrote a pamphlet which outlined the new direction his thinking had taken him. *Neurologic*, written while in solitary confinement, is Leary's fantasy of not only escaping from prison, but of escaping from the world. "Based on all the relevant facts from astronomy, genetics, and gerontology," wrote Leary. "we believe that the message of DNA is simple: Get Smarter! Increase velocity and attitude! The genetic entity wants off the planet!"[464] Over the next few years, Leary developed a philosophy based on three technological utopian ideals. He named the philosophy "SMI$^2$LE," which stood for "Space Migration, Intelligence Increase, and Life Extension." These methods, which he called "tactics of evolution," would help mankind achieve the "goal" of evolution: "Fusion (at higher levels of intensity, acceleration, and aesthetic

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[462]Timothy Leary. *Neuropolitics: The Sociobiology of Human Metamorphosis*. Los Angeles: Starseed/Peace Press, 1977. p. 148.
[463] Elizabeth Robinson, "Movement into Space: A View from Two Worlds," *L-5 News*, January 1977, p. 3.
[464]Timothy Leary. *Changing My Mind...*, p. 203-04.

complexity.)"[465] Migration off the planet, Leary claimed, was the key to solving all of Earth's many problems. "When humanity begins to work for extraterrestrial migration," Leary wrote in his 1977 book *Exo-Psychology*, "the competition for material acquisition will gradually diminish because unlimited space, unlimited energy, unlimited resources await in the extra-terrestrial solar system."[466] Combined with "intelligence increase" through the use of psychedelic drugs like LSD, Leary believed, humanity would soon discover the key to living forever.

In *Exo-Psychology, Neuropolitics* and *The Game of Life* Leary divided different philosophies into rungs on an evolutionary ladder, placing his LSD-inspired extraterrestrial thinking on the top rung. In an interview with the libertarian magazine *Reason* in 1977, Leary described the increasing centralization of authority in China, Russia and the United States, as "necessary" because these forms of government "are the only systems that can produce the scientific energy breakthroughs in their competitions with each other that are needed to further the evolutionary process of the human race." Explained Leary, "[w]e believe that the evolutionary process has been totally worked out. That the same process is going on in this planet after 2-1/2 billion years of the evolution of the nervous systems which is going on in millions of other planets... Inside every caterpillar is a butterfly, waiting to come out."[467] For Leary, the path of evolution was predestined, and it without question included mind-expansion and space migration. The fit between Leary's psychedelic utopianism and the promise of extraterrestrial evolution was a good one.

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[465]Timothy Leary. *Neuropolitics: The Sociobiology of Human Metamorphosis*. Los Angeles: Starseed/Peace Press, 1977.
[466]Timothy Leary. *Exo-Psychology: A Manual on the Use of the Nervous System According to the Instruction of the Manufacturers*. Los Angeles: Starseed/Peace Press, 1977, Preface.
[467]Jeff Riggenbach. "Timothy Leary's New Trip: A Reason Interview," *Reason*, April 1977. p. 32;34.

Leary was even more adamant than O'Neill in his condemnation of the shortsightedness of ecological restraint. "Growth restriction, back-to-the-earth ecology and zero-population plans," Leary wrote in *Neuropolitics*, "are clearly unsatisfactory answers, selfish, defeatist and pessimistic... Liberals, pacifists and ecologists, we see, are equally to blame for the current American malaise."[468] Leary dismissed his critics as "ecological puritans." "...[T]here are some among us, the ecological puritans, who say, 'Limit growth!' Well, you can't limit growth... It's not within the power of a domesticated primate race like ours to really change an evolutionary process which is two and a half billion years old, and is expanding throughout the galaxy."[469] Leary instead compared his desire to drop right off the planet with the desires of seventeenth century "Pilgrim mothers" who "mortgaged their possessions, and built the Mayflower, because they wanted a place where they could be free to live out the kooky, freaky reality that they collectively shared."[470]

In the end, support outside diehard space circles for O'Neill's idea would be spotty. The *CQ* responses confirmed that even if the American media and NASA had jumped all over the plan, that didn't necessarily mean that the American people were enthralled with it. For supporters outside space enthusiast circles or NASA, all Brand had to show for devoting an entire issue to O'Neill and launching a self-proclaimed space colonization movement was a monk, a couple politicians, a bevy of verbose artists, and maybe one population biologist/environmentalist. And Tim Leary. If this ragtag group was going to be at the helm of space colonization, representing the vanguard of the

[468]Timothy Leary, *Neuropolitics*, p. 136.
[469]Timothy Leary. "Neuropolitics: The Meaning of Space Migration," in *Worlds Beyond: The Everlasting Frontier*. Larry Geis and Fabrice Florin, eds. Berkeley, CA: And/Or Press, 1978. p. 257.
[470]Timothy Leary. "Neuropolitics: The Meaning of Space Migration," in *Worlds Beyond: The Everlasting Frontier*. Larry Geis and Fabrice Florin, eds. Berkeley, CA: And/Or Press, 1978. p. 255.

American people and Earth, then the split in the human species seemed to many to leave the bulk of the genetically worthy back on the planet.

Detractors to O'Neill's plan often echoed Vonnegut's assertion that the departure of the spacebound engineer was a splitting of society. However, O'Neill's colonies provided such an easy target of ridicule that most of the comments referred to the split wryly and even expressed satisfaction that the Earth could perhaps be rid of a cancerous influence. Countercultural economist and author of *Small is Beautiful*, E.F. Schumacher, wrote that he was "all for it," and that he had in mind "at least five hundred people for immediate emigration." For each of these colonists, "once they are well and truly gone," Schumacher offered to "donate $1,000.00 US dollars for the furtherance of the work that really needs to be done, namely, the development of technologies by which ordinary, decent, hardworking, modest and all-too-often-abused people can improve their lot." The split of the earthbound and the spacebound, hoped Schumacher, would result in less chance for truly innovative solutions too global problems to be rejected. "With the above-mentioned emigrants out of the way," he wrote, "it will be a great deal easier to obtain support for this work.[471]

David Brower, President of Friends of the Earth, repeated Schumacher's hope. He called the notion born of the sin of despair. "Despair," Brower claimed, "leads to Escapism." However, he qualified his remarks by claiming he “did not wish to be adamant.":

> If Mr. O’Neill’s colonies....prove more desirable than the present alternative, then let me be the first to place reservations for the first colony for all who would continue the atoms-for-peace/war experiment here. Let all of them, salesman and customers, be aboard the maiden voyage, absolutely free of charge, with a bonus if they promise to stay away.

[471]E.F. Schumacher, Letter, *CoEvolution Quarterly*, Spring 1976. p. 10.

> And let the rest of us stay here, on this poor old beautiful planet, plagued only by ourselves, and try in good heart to fix it.[472]

Author and geodesic dome popularizer Steve Baer saw a split as well, surmising that space colonies would become a Mecca for "car nuts." "I am suspicious that the space stations are the next step for these people, for the whole world would have a manufacturer, a model number, etc." Baer wrote. "Absorbing yourself in all that is to me just barely second best to putting in your time looking at your own asshole with a mirror and a magnifying glass." He also questioned whether the colonial interiors would resemble "Carmel by the Sea as Gerard O'Neill suggests." "Instead," Baer imagined, "I see acres of airconditioned Greyhound bus interior, glinting, slightly greasy railings, old rivet heads needing paint – I don't hear the surf at Carmel and smell the ocean – I hear piped music and smell chewing gum. I anticipate a continuous vague low-key "airplane fear." He concluded by wondering whether space colonies were "methadone for technology junkies…[473]

Biologist, pacifist, and winner of the Nobel Prize in 1967, George Wald, understood the space colonization plan as a split as well, but did not see anything funny about it. "*CoEvolution* has asked me to write my thoughts about Space Colonies – O'Neill's or any others. Let me say at once that I view them with horror," he began. Wald wondered who the inhabitants of the colonies would be: "Who is to go to them? The power elite of our over-developed society? The highly affluent? Who else?" he asked. "Perhaps, having made piles of money out of war, smart bombs, nuclear weapons, they can find in the Space Colonies the refuge from which to watch the rest of humanity killing and maiming and poisoning and mutating one another – deciding when it is safe to come back down." Wald's letter was one of the most impassioned and scholarly of those

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[472]David Brower, Letter, *CoEvolution Quarterly*, Spring 1976. p. 17.
[473]Steve Baer, Letter, *CoEvolution Quarterly*, Spring 1976. p. 12.

submitted. He spent a good portion of it making the case that the "dehumanization and depersonalization" reflected in the "poured concrete" ugliness of architecture in the International Style seemed a perfect preparation for space colonization. Pier Luigi Nervi, Le Corbusier, Walter Gropius, Mies van der Rohe and Paolo Soleri had created, in Wald's view, architectures without a future, since, as he wondered about one of Soleri's models, "[C]an you imagine trying to live, even to raise children, in such a place?" Wald's answer to human problems was not space colonization, but Earth cultivation. "If we cultivated rather than devastated the Earth --" he exclaimed, "then it could be a great place to live on and to enjoy – for the next six billion years! It's worth a try!" [474]

Biologist Garrett Hardin attempted to logically disprove the workability of space colonization by pointing out that if they were publicly funded, the colonists would have to include a variety of constituencies, such as "blacks, whites, Puerto Ricans, Chicanos, Indians from Wounded Knee, Wallaceites, American Legionnaires, Weathermen and members of the Symbionese Liberation Army." Such a mix of "tribes," Hardin felt, would be impossible to keep the peace among in a closed metal sphere. "How could such a fragile craft withstand the buffeting of warring tribes?" he asked. Instead, the group most suitable for space colony habitation would be homogenous and most likely "religious," but not, Hardin pointed out "a bunch of Unitarians or Quakers, for these people regard individual consciences as the best guide to action." Instead, he suggested that successful space colonization would require religious groups such as "the Hutterites or the Mormons," and that "scientists and college professors" like O'Neill would never be able to live aboard one of their own fantasies. "People of great originality and independence of spirit would be intolerable in the spaceship community…," he wrote. For Hardin, space colonization would not be an equitable split, but as Leary characterized it, a

[474]George Wald, Letter, *CoEvolution Quarterly*, Spring 1976. p. 16.; *Space Colonies*, pp. 44-45.

religious exodus to a commonly held "kooky, freaky reality." That reality, Hardin concluded, would be "totalitarianism." But he didn't think they would ever be built because those most enamored with them would never want to live on them – through this paradox, he predicted their utter failure.[475]

Stewart Brand had also invited the edgy countercultural cartoonist R. Crumb to attend the "Space Day Symposium," a Jerry Brown sponsored gathering which attempted to bring together the aeronautics industry and space colonization and industrialization dreamers. Coinciding with the first free flight landing of the newly developed space shuttle in the Mojave Desert, the symposium was not open to the public, but Brand was allowed, by Brown, to invite a few friends. Crumb's four-page, 25-panel cartoon documenting his experience at the event still stands as one of the most angry and political pieces ever rendered by the artist. It appeared in the Fall 1977 issue of *CoEvolution Quarterly*. In the cartoon, Crumb parodies the various scientists, NASA officials, industry spokespeople and astronauts pushing the plan, all the while describing his disillusionment with the entire affair. Most of the time, Crumb portrays himself in typically self-deprecating depressive mode, as a slouched, gaunt, bespectacled everyman with highwaters and huge shoes. But in the last frames, his bottled up anger pops, as he realizes that the promises made concerning "destiny" amonst the stars are really just a front "to drum up business for the aero-space corporations…" He left the weekend early, before the event's climax, the space shuttle landing, "utterly disgusted by the farce" he witnessed. In one of the last frames he portrays himself as clad in full 1930s space crusader garb, complete with a giant "R" emblazoned on his chest, and holding a ray gun. "Don't be duped by foolish Buck Rogers dreams of glorious adventures among the planets!!" he screams. Two panels later, he fills the available space with a rant:

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[475] Garrett Hardin, Letter, *Space Colonies*, pp. 54-55.

> But it's just more of the same old hype… to keep the 'economy' going… not unlike the 'Atoms for Peace' shuck and equally as dangerous! Yes, the space hype is… DANGEROUS!... Let's face it, the military WILL use space technology to create a whole new array of war toys in space at least as horrifying as anything they've already got, if not more so… But why am I raving against it? Why bother? The only thing that will stop them is a drastic breakdown in our industrial system… No moral or intellectual argument has ever stopped them in the past…

In the next frame, a lonely depressive Crumb walks slowly into a series of vaudeville spotlights, hunched over dejectedly. "The saddest part though… the saddest part…," he mourns. "is that alot of otherwise intelligent people are falling for the space hype… hook, line and sinker!! … But as for me, I wash my hands of it!!"[476]

However, the most venomous attack on O'Neill's idea came from author, poet, and simple-living advocate Wendell Berry. Berry led the earthbound charge against O'Neill's scheme through a dramatic exchange of letters with Brand. Although Berry savaged O'Neill and his plan, variously calling the physicist "a salesman," an "old buffalo hunter," a "strip miner," and an "evangelist," the poet reserved his most serious criticism for Brand himself for ever advocating space colonization in the first place. Berry's invited response in the Spring 1976 issue of the counterculture periodical was the first in a series of emotionally charged and angry letters directed to the *CQ* editor. In that issue, Berry questioned Brand on what was meant by the title of the magazine. "Fundamental to [the concept of coevolution], I thought, would be a suspicion of change by technological and governmental coup," he mused. Berry then went on to predict the opening of a rift in the counterculture itself, predicated upon *CoEvolution Quarterly*'s support for O'Neill.

> I admit that I am bewildered. Perhaps I will have to admit that I have been wrong. It is certain, however, that the Fall 1975 issue displays a potentially

[476] R. Crumb. "Space Day Symposium," *CoEvolution Quarterly*, Fall 1977. pp. 48-51.

> ruinous split between what I at least have thought to be coevolution and what I think the energy lobby would unhesitatingly recognize as Progress...[477]

Berry's "ruinous split," and the lines along which it would cleave, closely resembled the division predicted by novelist Kurt Vonnegut on the eve of the moon landing. But now it was the counterculture itself that was dividing along the lines predicted by H.G. Wells and J.D. Bernal. The counterculture's engineers were splitting from the ecologists; with the split, Berry lamented the possible end of an era. The supposed unity of the counterculture against the dominant culture was becoming a part of history.

Brand's response to all of the criticism levelled at O'Neill's plan came in the form of a two page letter appearing after all of the other commentary. He began by comparing the impact of Space Colonies to the impact of the atomic bomb. "The one says, 'We can destroy the Earth.'" Brand wrote. "The other says we can leave it, leave home. With that our perspective is suddenly cosmic, our Earth tiny and precious, and our motives properly suspect." Brand defended the technology of the Space Colonies against their detractors by denying that they were more of the "same old technological whiz-bang and dreary imperialism." For Brand, the New Earths of O'Neill were kosher because they were not *of* the earth. "Space Colonies are distinguished from other high tech mischief such as nuclear energy, the SST and the Arms Race by a major difference," Brand claimed.

> They take place outside the Earth's atmosphere. They are <u>separate</u> whole systems. The experiment of Colonies endangers only the experimenters. When high tech goes wrong on Earth it is the innocent who get the consequences, down wind, downstream, and down the years.

For Brand, Space Colonies were a "good" technology because they could not injure the Earth. In fact, as O'Neill and Brand liked to note, they offered the promise of solving all of Earth's problems. Brand then went on to call the Arms Race "a big bore" and advocated scrapping the proposed B-1 bomber to build a Model I Space Colony. He

[477]Wendell Berry, Letter, *CoEvolution Quarterly*, Fall 1976. p. 8.

backed up his enthusiasm by noting that recent Star Trek conventions in Chicago and New York had drawn 15,000 and 30,000 people respectively. [478]

Brand's blanket response to the serious criticism levelled at space colonies, as well as his advocacy of it, enraged Berry. In the Summer 1976 issue, *CQ* printed a series of letters exchanged between Berry and Brand within a three week period in April and May 1976. Berry called Brand's promotion of O'Neill's colonies "more and more irresponsible" and accused the editor of *CQ* of "an alarming display of smugness" in consistently dismissing "out of hand, so many people's objections and doubts." Berry told Brand that he felt as if he was asked to participate in a debate in which the outcome had already been determined.

Berry then savaged Brand's two page expression of support for space colonies with a hydra-headed attack. Of Brand's claim that the Arms Race was "a big bore," Berry expressed bewilderment: "I have no understanding at all of your willingness to be responsible for this statement. Is space colonization, then, to be a kind of governmental entertainment for those who are bored with war?" he asked. Of Brand's claim that life in space will be attractive not because it is easier, but harder and more romantic, Berry called this "a warmed-over Marine Corps recruitment advertisement – the same irresponsible promise, appealing to the same sad fantasy."

After savaging Brand's advocacy point by point, Berry summarized his thoughts: "[Y]our thinking... on this matter is demonstrably superficial, and its superficiality slides over a political alignment that I find both morally repugnant and personally threatening.

> The fact is that you cannot advocate space colonization without implicitly advocating an enlargement of governmental power and the enlargement and enrichment of the corporations... To point the issue more exactly, you are proposing to increase the tax burdens of those of your readers who are struggling to implement in craft shops, in communes, and on small farms ideas and hopes

[478]Stewart Brand, Letter, *CoEvolution Quarterly*, Fall 1976. p. 52-53.

> that you have supported... In practical terms, your advocacy of space colonization amounts to a betrayal of these modest settlements of the earth...

Berry wistfully looked back to a decade earlier, when the mission of his generation seemed more clearcut, more sure.

> Since 1968 I have followed what you did with what, to me, has been a satisfying interest and friendliness – not to mention a steadily growing sense of indebtednss and gratitude. But now you have set yourself up as what I can only look on as a political enemy... [T]hough you offer me room in your magazine to object, you are nevertheless willing to turn my tax money and my citizenship against me. I cannot be tolerant of that. I am not going to associate myself or my work with coercion.

With that, Berry signed his letter, "Wendell."[479] For a counterculture accustomed to attacking the status quo, infighting of this sort was particularly glaring. The split between the earthbound and the spacebound had progressed to the point at which one was explicitly referring to the other as the "enemy."

On May 1, Stewart wrote back, defending his advocacy. Brand's faith in human control of technology clashed with the poet's obvious belief in current and future high technology as inherently out of control. "I think that nuclear energy can be stopped, Wendell, and should be," Brand wrote.

> I don't think Space exploration can be stopped, but it might be made wiser. I may be wrong about that. I agree with you that a society can loot or it can learn, but not both. I would like to see us learn in Space, as well as here... Let us carefully watch the incremental steps into Space. It is a new natural history...[480]

Berry responded a week later and made clear to Brand that the questions involved in space colonization were not part of an academic debate, but went to the very core of the human future on Earth. For Berry, space colonization was the opposite of all "small solutions," and involved, at its heart, the question of "how much power some people may

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[479]Wendell Berry to Stewart Brand, Letter, April 27, 1976. in *CoEvolution Quarterly*, Summer 1976. pp. 8-10.

[480]Stewart Brand to Wendell Berry, Letter, May 1, 1976. in *CoEvolution Quarterly*, Summer 1976. pp.10-11.

be permitted to have over other people." Berry's last point in his letter was typically defiant: "It never occurred to me that I should be against space colonization only if it can be stopped. I shall be against it even if it can't be stopped."[481]

Berry and Brand's debate consisted of differences which were essentially theological and involved questions with such profound implications for human destiny that rational debaters quickly discovered that no rapprochement was in sight. Choosing between Earth and space involved a choice of such epochal dimensions and derived from roots so ancient and buried in religious faith that acrimony was foreordained.

Brand, perhaps humbled by the ferocity of dissent among those he counted as his friends and peers, began to cease devoting so much energy to the colonial cause. In 1977, Brand collected all of the debate concerning space colonies into a "CoEvolution Book," entitled, aptly, *Space Colonies*. Two other books about space colonization would be published that year – O'Neill's own *The High Frontier*, and T.A. Heppenheimer's *Colonies in Space*. But O'Neill's time in the spotlight had already passed. Even those whom one would consider his allies now began to turn against his idea. 1977 was the last year O'Neill would see funding from NASA and it quickly became clear that the new President, Jimmy Carter, was not a fervent supporter of the space program. With O'Neill's rejection by the generation of free-thinkers he had imagined would feel at home in space colonies, the physicist never looked back. Instead, he focused increasingly on space entrepreneurial ventures, and free-market capitalism.

A 1977 interview with Dan Rather for *60 Minutes* did not help O'Neill in his efforts to secure funding for the High Frontier concept. The report was more wryly derisive than supportive, focusing on the sort of die-hard space enthusiasts whom O'Neill

[481] This exchange was also described in my master's thesis: Ryan McMillen. *Picturing the Earth Alive*. Master's Thesis, University of Texas at Austin, 1998.

was trying to disassociate himself from. *60 Minutes* gave a significant amount of air time to space colony critic and *CoEvolution Quarterly* contributor John Holt, even though Rather claimed that Holt was "almost alone in challenging O'Neill's concepts." Holt described O'Neill as the "Reverend Moon for Ph.Ds," the leader of "a religion with just enough pseudoscientific trappings on it to appeal to people who know just enough about science to be impressed by that." Holt took direct issue with O'Neill's attempt to make the colonies look like Earth. "We can build human habitations in space," Holt admitted. "No question about it. We cannot, with any… reasonable extension of present knowledge, make them look like earth-like environments: the trees growing, the grass, and all that kind of stuff. Life out there would be extremely hard and dangerous. The hazards of space living we hardly know."[482] After seeing the 60 Minutes report, Senator William Proxmire laid down the law regarding further funding of O'Neill's idea. "Not one cent for this nutty fantasy," he said.[483]

NASA officials, recognizing that the 1975 Summer Study had, despite its rosy language, proven that O'Neill's colonization proposal was much more wishful thinking than practical engineering, began to disassociate themselves from the plan even earlier. Administrator Fletcher recognized early on that funding realities would not allow significant institutional backing for O'Neill. At the completion of O'Neill's 1975 Summer Study, the Fletcher dispatched a congratulatory letter to the physicist. Fletcher told O'Neill that space industrialization, and implicitly, colonization, was "a prime candidate" to be the agency's "major thrust" of the 1980s. O'Neill's proposal, wrote Fletcher, related directly to the agency's more short-term goals of establishing a space station, a possible solar power satellite, the servicing of satellites in "geosynchronous or lunar"

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[482] *60 Minutes*. October 9, 1977. "Space Colonization." WTOP-TV, CBS Network, Washington, DC. As transcribed by *Radio-TV Reports, Inc*. in NASA Archives.

[483] Michael A.G. Michaud. *Reaching for the High Frontier: The American Pro-Space Movement, 1972-84* New York: Praeger, 1986.

orbits, and a research and development laboratory designed for an unspecified "new class" of scientific activity. Despite Fletcher's enthusiasm for O'Neill's "imagination and vigor," the administrator's letter was cautious, careful not to provide the physicist with public relations ammunition to cast NASA's support as anything more than speculative. Fletcher informed O'Neill that the Office of Space Flight was providing only $50,000 for the coming year. "I note your comments regarding the sufficiency of this effort," wrote Fletcher, referring to a letter O'Neill had sent earlier, "however, with the overall limitations faced by the Agency, it is felt that this level will be appropriate pending the completion of our overall reviews of space industrialization."[484] In other words, O'Neill should not expect NASA to fully get behind the physicist's extraterrestrial social movement. The implicit message was that O'Neill was on his own in maintaining public interest and support in his vision for at least another funding cycle. In addition, Fletcher was steering O'Neill towards space industrialization, and trying to get him to focus his energies on more near-term extraterrestrial challenges than the creation of a mechanical heaven.

Even physicist Freeman Dyson, whose driving ambition was to see the human settlement of the solar system in his lifetime, admitted in his 1979 confessional-biography that the prospect of living within the O'Neillian vision was not all that appetizing. While supporting O'Neill's larger goal of "greening the galaxy," Dyson regarded the space colonies as an example of "gray technology," as opposed to what he called "green technology." For Dyson, "gray technology" was exemplified by "factories… physics… plutonium… bureaucracy… self-reproducing machines… [and] clones…" "Green technology" was exemplified by "gardens… biology… horse

[484] James C. Fletcher to Gerard O'Neill, Memo, September 1975. NASA History Files.

manure… pioneer communities… [and] trees and children."[485] "Gray technology can build colonies in space in the style of O'Neill's 'Island One,'" he wrote, "cans of metal and glass in which people live hygienic and protected lives, insulated from both the wildness of earth and the wildness of space.

> We will be lucky if the people in these metal-and-glass cans do not come to resemble more and more as time goes on the people of Huxley's Brave New World. Humanity requires a larger and freer habitat… The fundamental problem of man's future is not economic but spiritual, the problem of diversity. How do we find room for diversity, either on our crowded earth or in the metal-and-glass cans that our existing space technology provides as living space?[486]

At the same time, the elements of the 1960s counterculture which had thrown their full energy and muscle behind O'Neill's space colonization idea abruptly reversed course as the development of outer space seemed more and more to be an excuse for militarism and imperial dominance over the whole of the Earth. Leary and Brand did not abandon their exo-millennial mindset, but instead moved on to the next technological utopian dream of the twentieth century – the personal computer revolution. In 1987, a year after the space shuttle Challenger's tragic explosion, Leary reissued his main treatise on space colonization, *Exo-Psychology*, under a new name, *Info-Psychology*. Explained Leary in the preface, "My high-tech ignorance in 1976 accounts for the over-emphasis on space colonies and post-terrestrial psychology... The Info-Worlds which our species will discover, create, explore and inhabit in the immediate future are not to be reached from Canaveral launch-pads alone, but through our computer personal (sic) screens."[487] Leary kept the technological utopianism of the original volume intact, but included an Appendix so that readers could update his already outdated prose. Explained Leary in a

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[485] Freeman Dyson. *Disturbing the Universe*. New York: Harper & Row, 1979. p. 227.
[486] *Disturbing the Universe*, p. 233.
[487]Timothy Leary. *Info-Psychology: [A Revision of Exo-Psychology]*. Los Angeles:Falcon Press, 1987. p. iv.

uncharacteristic *mea culpa*, "I wrote this book... before the arrival of Eve's Electronic Apple. Before Steve Jobs and Steve Wozniak..."[488]

Brand went in a similar direction, starting up a computer magazine spin-off of the *Whole Earth Catalog*, and writing a book on MIT's visionary computer laboratory.[489] When asked in 1994 what he would change about the *Whole Earth Catalog* if he could, Brand immediately responded, "I was wrong about geodesic domes and about the immediate appeal of space colonies."[490] Today, Brand serves on the board of advisors of the Foresight Institute, a non-profit institution "founded to help society prepare for nanotechnology,"[491] the atom-by-atom manipulation and construction of matter. Nanotechnology, which promises free goods and food for all in the coming millennium, is one of the more extreme forms of technological utopianism. Not coincidentally, the seminal work on the wondrous (and apocalyptic) possibilities of nanotechnology, *Engines of Creation*, was written by one of O'Neill's early students and space colony collaborators, Eric Drexler.[492]

For the aging psychedelic movement of the 1960s, personal computers became the new technological utopianism, the latest innovation to promise deliverance to a better, more highly evolved future. Seemingly expressly designed for a psychedelic technologist, the personal computer offers easy access to information, the ability to express oneself however one chooses, and individual ownership of a virtual world. In 1996, Timothy Leary died of cancer and related his last days to visitors to his website. Appropriately, a small lipstick-size canister of his ashes was launched into space aboard a

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[488]Ibid., p. iv.
[489]Stewart Brand. *The Media Lab: Inventing the Future at MIT*. New York: Viking, 1987.
[490]Vic Sussman. “A born-again Whole Earth Catalog,” *U.S. News and World Report*. November 14, 1994. p. 118.
[491]"About the Foresight Institute," *www.foresight.org/FI/index.html*. June 30, 2004.
[492]Eric Drexler. *Engines of Creation*. New York: Doubleday, 1986.

rocket later that year. Accompanying his remains on that final journey were the ashes of Gerard O'Neill and *Star Trek*creator Gene Roddenberry.

By 1980, the institutional support for O'Neill's plan from NASA had all but evaporated. In a public affairs booklet, the agency distanced itself from the space colonization proposals, even to the extent of appearing embarrassed for their past support. The booklet gave a four-point disclaimer regarding NASA's view on O'Neill's space colonization plan.

> 1. Space settlements are no longer being studied by NASA. A workshop study was conducted in 1975 to explore the space settlement concept.
>
> 2. Establishing settlements in space would be very costly. Both the hardware required and the technology needed have not been developed. The number and background training of people to occupy a settlement is unknown;
>
> 3. There is within NASA no recognizable need for a space settlement project now or in the near future.
>
> 4. NASA has no plans at this time to establish a space station on the lunar surface.[493]

But by 1980, O'Neill had moved on. His 1977 Summer Study was weighted heavily towards space industrialization, and the physicist seemed more concerned in that study with mining the moon than creating interior Earth wonderlands in space. Frustration with NASA, with the U.S. Congress, with the response from the counterculture, and even with the "space groupies" which had formed a movement behind his plan, drove O'Neill away from the limelight and back into research and inventing. Members of the L-5 Society which he had inspired also became disillusioned during the Carter Administration as one space development bill after another died in committee. Space was no longer a priority, and for those who believed most fervently in

[493] Cited in Leonard David, "Space Colonization: Artificial Worlds for Artificial People?" in *Aviation/Space*. March/April 1980. p. 30.

the deliverance of humanity from a doomed planet, such intransigence in the face of apocalypse could only be caused by ignorance or criminal intent.

By the middle of the 1980s, former L-5 Society members and space colonization supporters would hold positions throughout the Reagan government. No longer was space colonization the main focus of their efforts; instead, cognizant of the role the military played in paving the way for manned spaceflight in the first place, many would-be space colonists, still true believers in the exo-millennial ideal, hoped that military applications would again help jumpstart the movement of humanity into space. But now, they looked to the Star Wars missile defense program as the major bootstrap to elevate them off of the planet.

A day before Congress' Christmas recess in 1981, a young Republican Georgia Congressman by the name of Newt Gingrich addressed an impassioned letter to his commander-in-chief, President Ronald Reagan. Gingrich urged Reagan to approve $9 billion for NASA in the coming fiscal year for the construction of six new space shuttles and the formation of a plan to build a "a permanent space station and… industrial park around the earth that will create jobs on earth by creating jobs in space." Gingrich claimed that space was "vital militarily" in the battle against the Soviet Union.

However, Gingrich concluded his letter with a more religious reason for space industrialization, militarization, and settlement. "[S]pace represents the spiritual frontier towards which we must move." Gingrich reminded the President of the words of his January inaugural address: "We are too great a nation to limit ourselves to small dreams. Great nations require great dreams."

> Space, as both a challenge and a project, helps define a positive, hopeful vision of the future large enough to rally the entire free world. As the Bible warns us, 'Where there is no vision, the people perish.'[494]

[494] Newt Gingrich, Letter to President Ronald Reagan, December 23, 1981. NASA History Office.

With the demise of the 70s, and the ascent to power of the Reagan conservatives, outer space became spiritualized in a millennial manner far different from O'Neill's groovy countercultural dreams of heaven. The Presidency of Ronald Reagan meant that nuclear weapons had returned as the apocalyptic bargaining chip to end all bargains, and that space would lose any semblance of being an international zone of peace and cooperation. Space changed again, and this time became not only a region of rapture fantasies, but a militarized zone lorded over by high-tech weaponry and surveilled by increasingly intrusive spy satellites. The new 1980s vision of the space future would be of an angry Calvinist God come to Earth – an omniscient, omnipotent, and heavily armed Jehovah, bent on protecting the holy United States from the wrath of transgressors, but also bent on indiscriminate judgment in breathless anticipation of the approaching Millennium. The Space Age had given way to the Earth Age, but not everyone had the same idea concerning the destiny of the Earth.

## 14: The Hollow Earth

On the surface, the flirtation of Americans with space colonies in the mid-1970s -- can be dismissed as so much post-Apollo extraterrestrial utopianism, merely an attempt to capitalize on the fast-withering Space Age enthusiasm which infected the nation post-Sputnik. Yet a deeper force is at work in the space colonies which bespeaks a more complex psychological interpretation. For the space colonies of Gerard O'Neill are not just, or even primarily, the product of a dying Space Age; they are even more so the product of its successor Earth Age. In truth, they are a strange hybrid, and an attempt to unify two opposed ideologies under the rubric of a single immense utopian dream.

Living in one of O'Neill's space colonies, despite the poetic rhetoric of freeing oneself from the desperate death sentence of a prison Earth, is not so much living *off* of the Earth as living *inside* the Earth. Both separation *from* the planet, and entombment *in* the planet are accomplished at the same time. For just as a hypothetical space colonist is no longer bound to the surface of a gravity-strong Earth, the colonist is simultaneously surrounded by, and bound within, the weightless interior of a manmade planet. Living in a space colony frees the colonist not just from the gravity well of Earth, but from the boundlessness of an open and infinite sky.

The resurgence of the Earth motif after the Space Age can be seen as a reactionary response to a bold, inevitable and mind-boggling future amongst the stars. The paradoxical effect of living inside a space colony would be separation from the cosmos one had left the Earth to enter in the first place. Whether a windowed or aluminum roof, there would always be something between the colonist and the glory of the night sky. The colonist would always be on the inside looking out. That is, if they wanted to look out, because inside a space colony could be accomplished the complete

interiorization of existence – a sort of self-sufficient mall in the heavens. O'Neill's space colonies, then, can be seen as a reactionary response to both the Earth Age and the Space Age – an attempt to deny the realization of the infinite cosmos by turning the planet, literally, inside-out.

In rejecting the Earth as a sustainable home for mankind, O'Neill was also rejecting open air living on the surface of a planet. In rejecting the uncontrollability of Earth's natural systems and man's inventive capacity, O'Neill was replacing the uncertainty of life on Earth with the supposed certainty of manmade and controlled life inside an artificial Earth. To understand the psychology of O'Neill's "interiorization" of the Earth, one must again travel back to Newton's era to see how the cosmos was imagined during his time. Few people during Newton's era believed that the Earth was flat. However, an increasing number of theories proposed by quite learned individuals theorized that the spherical Earth was actually hollow and that perhaps entire other races of beings lived on the inside of the Earth. Over the next three centuries, hollow Earth theories would crop up again and again, and while they would never become acceptable in scientific circles, examining the ideological roots of their imagination sheds light on the psychological will to space colonization. The hollow Earth provided conceptual refuge for those too afraid to encounter the infinity of the revealed Copernican cosmos.

Medieval geology was rather simple, and in fact, assumed the existence of a hollow Earth. Indeed, the Earth was rarely conceived as a sphere by the layfolk, and the ancient Judaic conception of a sandwich universe – Sheol (later Hell) below; Earth in between; and the firmament above – formed the basic outline of most people's imagination. The Earth was hollow, but the Earth was flat, amidst waters, so there was no end to Hell beneath.

While this view was the popular one, scholars adopted an Aristotleian vision which held that the universe consisted of a series of concentric spheres or levels. Hell was inside the sphere of Earth, Earth was inside the sphere of the revolving planets and sun, the stars were inside a further sphere, and so on. For scholastic theologians, the Earth was always a solid mass within which was imagined an interior Hell. From Aristotleian physics, theologians determined that the interior of the Earth was composed of imperfection, material worse than dust. Since objects fell, and tended down, the interior of the Earth was heavy, dead – of the grave. By contrast, as fire tended upward, towards the shining stars and planets, that which was furthest away from the Earth was luminous and bright. Since beyond the stars was the empyrean realm of God, deity, perfection, and holiness were associated with bright white light.

It is this dark Earth as contrasted with the lights of the sky which provided Thomas Aquinas with his logical post-apocalyptic transformation of the Earth into a transparent, glass sphere. According to Aquinas, the Earth's surface will be as glass, and within the Earth, the dungeon of hell would remain, still dark and murky, filled with tortured souls. The risen inhabitants of the empyrean realm will be able to see the damned, as if in a snow globe, their punishment a stark contrast to the heavenly life of static bliss enjoyed by the blessed. Dante's vision was also of a hollow Earth, in which sat the nine circles of Hell, each one deeper, darker, and more horrific than the last.

Copernicus, Kepler, and Newton helped to discredit this medieval conception and decentralize the Earth. Yet the idea of the Earth as either hollow, or more radically, the idea that the surface of the Earth was actually part of an an enormous concave structure containing a central sun and the celestial firmament within, survived. Variants of the hollow Earth idea cropped up again and again, often in theories advanced by very respected and learned astronomers and mathematicians. All possessed an odd but

understandable elegance. Such ideas promised to vanquish the alienation visited upon the Christian world by the Copernican decentralization of the Earth. Such ideas also promised to provide the European imagination with fantastic lands, peoples and animals as yet unconquered.

At the end of the seventeenth century, as the Age of Exploration was nearing completion, Newton's contemporary Edmund Halley theorized that the Earth was spherical but not solid and that within the planet lay subterranean levels within which lived other life forms including humans. Halley's treatise appeared in the pages of the Royal Society's *Philosophical Transactions* and there he advanced the hypothesis that inside the Earth existed three concentric hollow spheres surrounding a blazing core. Halley hypothesized that these spheres might possess exotic life-forms and tried to explain the shifting magnetic poles of Earth via the shifting of these subterranean spheres. According to Halley, the aurora borealis and aurora australis might be phenomena caused by the seepage of an exotic gas buried deep within these spheres.[495] At the dawn of the nineteenth century, the Scottish inventor and physicist Sir John Leslie theorized that the Earth was hollow and contained two interior suns. Euler dubbed these suns Pluto and Proserpine, after the tempestuous Roman husband and wife of the underworld.[496]

In a similar vein, in the middle of the eighteenth century, the British natural philosopher Thomas Wright published *An Original Theory, Or New Hypothesis of the Universe*. Wright is occasionally (but erroneously) credited with first conceiving of the Milky Way as a flattened disk of stars contemporaneously with Immanuel Kant. In fact, later astronomers adopted Wright's observations to arrive at this perspective. Instead,

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[495] Halley, Edmond, "An account of the cause of the change of the variation of the magnetical needle with an hypothesis of the structure of the internal parts of the earth: as it was proposed to the Royal Society in one of their later meetings," *Philosophical Transactions of the Royal Society of London*, 17:563-578.
[496] Donald E. Simanek. "Turning the Universe Inside-Out: Ulysses Grant Morrow's Naples Experiment," http://www.lhup.edu/~dsimanek/hollow/morrow.htm. Accessed June 30, 2004.

Wright envisioned, echoing the ancient Greek perspective on the night sky, that most of the visible stars were part of the shell of an enormous celestial sphere. Yet Wright departed from ancient Greek cosmology by counting the Sun as one star among many in this shell, instead of central to it. According to Wright, the Milky Way was merely the visible portion of this shell, and furthermore, the Milky Way, and the Sun included, were concentric to the seat of God, who Wright depicted in models as an enormous eye, dispersing dazzling beams of light in all directions, watching and knowing all. As such, Wright reversed, or inverted, the Aristotleian model which held that God existed outside and all about the presumed celestial sphere. In Wright's vision, God was at the center of the cosmos, with the stars of the Milky Way suspended as if part of an enormous celestial panopticon.

However, in 1775, Wright abandoned this vision entirely in the aptly titled and decidedly less popular *Second or Singular Thoughts Upon the Theory of the Universe*. Wright became disturbed about certain implications of his previous theory, which surmised that the Milky Way "sphere" was one of many similar spheres. In his initial theory, he explained the existence of star nebulae – today, other galaxies – as spheres separate from the one in which was embedded the Sun. Since he had already placed God's all-seeing eye at the center of the Milky Way, this raised all manner of pluralistic conundrums concerning the uniqueness of God. Did all galaxies contain a different God's eye? Faced with this conundrum, Wright disavowed his earlier work and instead came up with a different theory, but now based on the assumption that there was only one central God. Wright imagined that the visible universe was a set of nesting spheres and the Earth was within a spherical cavity. The stars above were part of another sphere, the

ground below was solid, and humanity lived within the hollow thus created. God was now comfortably at the center of the celestial sphere, still with his eye blazing away.[497]

Such ideas continued to stoke the imagination well into the nineteenth century. As the available temperate lands of Earth gave way completely to the Age of Exploration, the concept of a possible entrance to the interior of the Earth, situated at the poles, became of interest to would-be intrepid polar explorers. In 1818, John Symmes, a veteran of the War of 1812, began to propagate his theory that the Earth was hollow, that apertures at the North and South Pole allowed sunlight from the alternating endless nights of the polar summers into the region inside, and that this interior Earth not only existed, but could be colonized for the glory of the nation. In the 1820s, Symmes attempted, no doubt inspired by the recent elevation of Lewis and Clark to national heroes, to lobby Congress to finance an expedition to the poles for the purpose of annexing the interior Earth. Symmes' idea met with some popularity and some ridicule and Congress not surprisingly never laid out the required funds.

Even into the twentieth century, hollow Earth fantasies continued to multiply, almost always in the guise of a quasi-religious creed or as part of complex occultic theories. In the late nineteenth and early twentieth century, a new twist on the hollow Earth theory was proposed by a man by the name of Cyrus Teed. Teed would later rename himself Koresh, and founded a religion named Koreshanity with headquarters on Estero Island, Florida. Teed advanced the belief that humanity did not live on the surface of a sphere, but instead, like the supposed peoples believed to dwell in Halley's subterranean regions actually lived on the interior surface of a hollow sphere. Just as one cannot see beyond the horizon because it bends out of sight due to the curvature of the

[497] Thomas Wright. *An original theory or new hypothesis of the universe*. London: Chapelle, 1750.; Thomas Wright. *Second or singular thoughts upon the theory of the universe*. M.A. Hoskin, ed. London: Dawsons, 1968.

Earth, Teed believed that the horizon bent up, not down. The sun and stars, theorized Teed, were actually in the *center* of the hollow sphere, and one could, theoretically, travel around the universe by keeping one's feet on the ground.

Like Halley, Teed believed that the rotation of the Earth allowed mobility along the inner surface of the sphere, as the centrifugal force of the rotation would keep the theoretical interior Earth dweller fixed to the ground. However, Teed believed that humanity actually lived on this inner surface while Halley only theorized the existence of other races and lifeforms on the inside of the planet. Teed's belief followed logically upon the theories of Halley and Symmes; only now the subterranean peoples inside the Earth were us. The net effect of Teed's hollow earth theory was to insulate the believer against the alienating and intense effects of Copernican heliocentrism. Instead of providing a sense of existential dread, as the Copernican encounter with the infinite and inconsequentiality of the Earth tended to elicit, Teed's theory again placed humanity and the Earth in a position of extreme centrality in the universe. The surface of the Earth, then, according to Teed/Koresh, took the place of the medieval Primum Mobile, the outer circle of heaven which encompassed the entire universe. Instead of the Earth as a small planet rotating around an average sun, Teed's hollow Earth theory provided the believer with a sense that all the universe was actually under control and visible. The Earth was even more important than geocentric thought implied – it was not at the center of all the universe, but actually surrounded all the universe. The Earth's "centrality" was its utter peripherality.

Konstantin Tsiolkovsky generated the most directly influential hollow Earth inspiration from which O'Neill's colonies would derive. Unlike previous imaginations of the hollow Earth, Tsiolkovsky sought to technologize the imagined interior spherical life in the absence of the existence of an actual Earth womb. At one point in his writings, he

asks his reader to perform a thought experiment in which the Earth loses its gravity and is subsequently turned inside-out – essentially making the entire planet into a self-contained, inward-looking spaceship Earth. The immediate effects of the thought experiment are terrible to comprehend, an exercise in imagining the Apocalypse: "The Earth has lost its gravity: instantly the air disappeared, rivers and seas became still, boiled up or frozen over; plants shriveled, animals perished. Much more would occur, but not everything can be foreseen or described." But Tsiolokvsky's goal is to get the reader to imagine the inversion of the Earth: "There is no gravity, but let us suppose the air and the seas and rivers remain. This is not easy to arrange, but anything can be assumed." The rocketeer imagines that a "strong crystal envelope like the imaginary sky of the ancients" might be constructed that would prevent the dissipation of water, and the destruction of the animals and plants. And then Tsiolkovsky turns the Earth inside out. "Let us further assume that the terrestrial world has become a hollow sphere, turned inside out. The air, trees, houses, people, rivers – all are on the inside of the sphere, while the masses of the Earth gush out of its bowels. In this way, gravity will be naturally abolished." But Tsiolkovsky needs a way to allow light into his interior Earth. In the thought experiment, this is a problem easily solved. "Now let us place a small sun in the centre of our new habitation," he writes, "and make the best of our eternal daylight… However, we look at it, we are living in our usual conditions, the only thing lacking is gravity."[498]

Tsiolkovsky's attraction to hollow spheres derived from the physical deduction that while a massive sphere of molten rock such as the Earth exerted a strong gravitational force on its inhabitants, living within a hollow sphere would not. "Sometimes enormous masses of whatever size produce no mechanical effect on bodies,"

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[498] Konstantin Tsiolkovsky. *Dreams of Earth and Sky*. In *The Science Fiction of Konstantin Tsiolkovsky*. Adam Starchild, ed. Seattle: University Press of the Pacific, 1979. pp. 69-70.

he observed in *Dreams of Earth and Sky*. "Thus an empty sphere with concentric walls and an empty cylindrical pipe with similar walls produce no mechanical effect on bodies placed inside them, not only in the geometrical centre but anywhere at all." With the sphere hollowed out, and all life placed on the inside, along with an interior sun, the inhabitants of such a structure would presumably become as weightless as angels. Once the sphere was rotated, however, those would, through centrifugal force, be able to walk or crawl along the interior of the sphere.[499] The choice between weightless bliss and Earth-gravity simulation could be directly controlled, through machines crafted by men – the machines and their paternal technocratic elite who pull the literal levers and thus manipulate, at will, the terrestrial or extraterrestrial experience of the inhabitants within. Thus, the experience of Rapture becomes a project of the technocratic man-Gods of the future and not a secret event of any moment unknown, decided by God.

In the colonies of Gerard O'Neill, the psychological effect of hollow Earth belief and Tsiolkovsky's technology is made real and realizable. O'Neill's colonies, inspired by the photographs of a spherical Earth from space, are the technological realization of the hollow Earth dream. It is as if the photographs of Earth from space proved so alienating and frightening that the desperate cloning and inversion of the Earth became a psychological necessity. The nuclear fear that O'Neill cited as the primary reason for human separation from the planet and migration to a series of multiplying inverted planets, made the notion of Earth-interiorization attractive and justifiable. As such, O'Neill's colonies bear striking similarities in ideological impetus to bomb shelters and shopping malls, those other internalized and claustrophobic architectural products of the Nuclear Era. One cannot only be separate from the seat of a seemingly imminent terrestrial apocalypse, one can also participate in the populating of an opposite, inside-

[499] This would be possible only near the equator; at the poles, the pseudogravity would not hold.

out, and upside-down world, a world imagined as being free from all the dangers plaguing the imperfect spherical planet called Earth. It is a world utterly inverted, in form and function, and as imagined by O'Neill and his followers, a world in which social norms, governmental strictures, and terrestrial imprisonments are inverted, or overturned, as well.

In the *Physics Today* article of September 1974, O'Neill lacked the services of professional artists so he generated the illustrations himself. Two illustrations in particular, together captioned "Section of a space-community main cylinder," both evoked the inverted and mysterious reality of previous hollow Earth illustrations. The simplistic workmanlike sketches were colorless and crude but made up for their shortcomings in the sheer oddness of their terrestrial inversion. The top illustration compared a circular cross-section of O'Neill's initial cylindrical plan for space colonies with the superimposed silhouettes of a boat, a skyscraper, and a long suspension bridge. The moon-like mandala of O'Neill's cross-section dominated the rough schematic, dwarfing the earthbound structures. Arrows, representing sunlight refracted from giant "planar" mirrors, draw the attention to the cross section at the four o'clock, eight o'clock and noon positions along the circumference. Another arrow attempts to demonstrate the rotation of the colony, in a counter-clockwise direction. Inside the circle, at six points along the inside surface of the cylinder, are alternating locations for human-occupied "Valleys" and windows. Each window would admit light for the "Valley" directly across from it, on the other side of the interior of the cylindrical body.

Below this illustration appeared an even more striking one of O'Neill's hypothetical "valleys," which appeared to also emerge out of the fantasies of Symmes or Teed. Also simplistic, the image depicts a cutaway view of one sixth of the cylinder. Instead of seeing depictions of buildings and cities, however, O'Neill is more ambitious,

and draws not only clouds, identifying them as existing at “Cloudbase 3000 feet,” but also the amateurishly rendered profile of a mountain range. The scale of O’Neill’s project, from this one image, is immediately made mind-boggling. The mind swoons at the size of the project, and at the ambition of O’Neill. In the caption, O’Neill makes an early attempt to portray the colonies as possessing an environmentalist and eco-friendly aesthetic. “Although the space-community valleys offer new landscaping opportunities and architectural possibilities,” O’Neill writes, “It is reassuring to note that certain Earth features can be recreated; the side view of a cylinder and cap includes a mountain profile taken from an aerial photograph of a section of the Grand Teton range in Wyoming.” Given O’Neill’s comforting words about how “reassuring” it is to note that mountain ranges can be built inside a 16-mile long metal cylinder in zero gravity, one would assume that some description of the method of building extraterrestrial mountains would appear in the article. Instead, in the article O’Neill merely refers back to the figure as “proof” of the feasibility of mountain construction: “As we can see in figure 1, it is possible to recreate certain Earth features...” Nothing else is said about the cost of recreating the Grand Tetons.

Like O'Neill's new Earths, conceptions of a hollow Earth often envisioned the interior of the planet as either inhabited or inhabitable. In the hollow Earth theory, the imaginary region formerly identified as Hell became colonizable. Even Hell, the hollow Earth consciousness implied, was open to salvation. The heathen of the farflung corners of the globe, untouched by Christ, but beginning in the 1500s to be contacted by European missionaries, lived in a sort of Hell. The rise of hollow Earth theories and the notion that the interior of the planet could be colonized and its people contacted was little different than the European encounter with the New World, Asia, and Africa. All the

world was a Christless Hell and all the world was worthy of redemption, including the inside of the world.

O'Neill's colonization of heaven, then, is also similar to the colonization of hell. It is no coincidence that O'Neill imagines his colonists as liberated and modern, happy and free, able to engage in low-gravity sex and fine dining. The colonies are hells in their mischievous and naughty sense, but also in their interior spherical experience. Yet at the same time, they are in heaven, gloriously free of gravity and the grave. O'Neill, keeping with the spatial hierarchy of Christianity, elevated his utopian heavens off of the depraved Earth. At the same time, to protect his heavenly denizens against the airless void, he turned the planet inside out, putting a terrestrial Eden at the spatial equivalent of the Earth's interior, or Hell. O'Neill heaven-ized Hell and Earth.

In space colonies, the union of the Dantean “inner-earth-as-hell” and the hollow-Earth “inner-Earth-as-paradise” is made possible. By placing the utopian frontier paradise off of the Earth and into the weightless freedom of a spiritualized outer space, O’Neill was working within the extraterrestrial value system endemic to the spaceflight movement. O’Neill’s disdain for locating human settlements on planetary surfaces served to make all planets, not just the Earth, into gravity wells binding humanity to the uncertain vagaries of nature and catastrophism. Planets in the O’Neillian extraterrestrial vision were hells of a sort – locations unsuitable and even suicidal for an “expanding technological civilization.” Paradise, then, needed to be off of the Earth, off of all planets, and in free space. Such was the Braunian, Tsiolkoskian, and ultimately Newtonian-Dantean vision which O’Neill was heir to.

The genius of O’Neill’s vision lies in its inversion and reinvention of the recurrent motifs of Paradiso and Inferno, heaven and hell. O’Neill does not deny hell; in fact, his hell is not only of Earth, as in being part of Earthly existence; his hell is life on the

surface of Earth, and indeed, life on the surface of any planet or moon. Gravity for O'Neill, as for Tsiolkovsky before him, is a form of hell. Being trapped on the surface of a planet, and being able to look out into the infinite black, is for O'Neill, the ultimate temptation, and the ultimate separation of mankind from the extraterrestrial destiny which awaits those bold enough to venture forth – the chosen people.

There is a whiff of a guilt-addled libertine's best-case scenario of what hell might be like in the bizarre anti-Boschian world of O'Neill's colonies. In the center of the new Earths, instead of a revolting netherworld of fire and brimstone, is the opposite – a strikingly beautiful, eternally spring cave, filled with greenhouse sunlight, its inhabitants weightless, flying freely for miles, over jungles of foliage and constantly running brooks and streams: a veritable Eden where Hades had been. O'Neill's libertarian ethos, portrayed these orbiting Edens as the potential seedbeds of anarchy and radical self-government: "free" cities like Amsterdam, New York, or Bangkok, where nudists, freethinkers, and radicals could gather and live out their lives free from the fear of federally or societally mandated sins. Those unfit for the heaven of Earth would be granted the heaven of the sky – the triumph of the counterculture, the extraterrestrial vindication of the flip side of reality. It would not be Dante's hell for the sinner, but an extraterrestrial heaven where hell was said to be.

Instead of orbiting Edens, in this reading the colonies resemble reformed Hells, where pleasure is no vice and freedom a virtue. The Hell is transported to an Earth dying and poisoned, littered with nucleated land, ruled by despots and thieves – a world running down, in eternal decline, doomed for destruction, a place of true sin. In O'Neill's book, *2081: A Hopeful View of the Human Future*, space colonies then become the hopeful wish for some kind of deliverance, even one subsuming the human in the machine, if that at least meant self-willed flight, self-determination, and self-expression.

But there is a deeper psychology to the interiorization of life in space than just a medieval theological one. Just as the space capsules of Apollo became the logical extension of the automobile's land-based machine cocoon, space colonies become an extension of the space capsule, only larger. Space colonies represent a step in the evolution not just of mankind, but perhaps more importantly in the evolution of the machine, and specifically, the evolution of the cyborg. To encase oneself entirely in a manmade world, controlled utterly by the actions and choices of men, is to relent that the machine has defeated the world.

Lewis Mumford recognized this subsuming of the human form beneath and within the machine; he called it the product of the "megamachine," the collective ideological drive towards order and control through mechanization which characterized the global military-industrial complex. This force, Mumford felt, was eating humanity, consuming its flesh and replacing people with silicon robots. For the space race, Mumford reserved his most acerbic comments. The space capsule, he wrote, was the modern-day equivalent of the Egyptian tomb, a rocket-propelled sarcophagus. The capsule "corresponds exactly to the innermost chamber of the great pyramids, where the mummified body of the Pharaoh, surrounded by the miniaturized equipment necessary for magical travel to Heaven, was placed." The astronaut, bound into the capsule with wires, tubes, and apparatus was in a state of "temporary mummification" and "suspended animation." Mumford saw the space program as possessed with a fanatical religious zeal born of "megatechnics," and saw the astronauts as participating in a horrific, life-denying ritual due to a "mixture of adventurous impulses and religious convictions of the deepest

sort… they need a deep religious conviction, all the more serviceable of unconscious of their role as Heavenly Messengers."[500]

When asked by Stewart Brand of his opinion on O'Neill's space colonies, Mumford was succinct. "If you were familiar with my analysis in the 'Pentagon of Power,' you would know that I regard Space Colonies as another pathological manifestation of the culture that has spent all its resources in expanding the nuclear means of exterminating the human race." The space colony project was for Mumford an "infantile fantasy," that served only to divert the attention of the public away from the consumption of humanity by the megamachine.[501] Mumford's dark view of O'Neill's proposal identified the pervasive sense of interiorization which characterized the post-WWII aesthetic of nuclear fear. Mumford recognized in the meaning of the space capsule the very opposite of the freedom which the project was heralded to bring about. The freedom that was promised could only occur through the subsuming of the human form to the perfect synchronization of the machine. Both the shopping mall and the bomb shelter similarly turned away from the outside world, a natural above-ground world of sunlight now eternally threatened with the prospect of a manmade apocalypse of fire and ash. In a sense, the flight of Sputnik, in its veiled threat of nuclear delivery anywhere in the United States, ruined the world for Americans, made nature even more abhorrent, in that the outside world sat passively by, defenseless, as humanity's technologies threatened to turn the planet into a wasteland as dead as the surface of the barren moon. The mall, the bomb shelter, and later, the space colony plan, all relied on this deep current of terrestrial disdain and pervasive fear.

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[500] Lewis Mumford. *The Myth of the Machine: The Pentagon of Power*. New York: Harcourt Brace Jovanovich, 1970.
[501] Lewis Mumford, Letter, *Space Colonies*, p. 34.

And yet, at least in the case of the mall and the space colonies, some attempt was made to make the interior space appear lush and green, *as if* one were encased in a self-sustaining ecosystem which operated seamlessly with human desire and technology. Malls sprout vegetation from every escalator well, every food court, every corner – all to keep the humans inside connected to the source of their life, while separating them from the elements of weather and air which truly make that life possible. Space colonies took the concept of the mall and bomb shelter to its logical post-Earthview perspective: clone the Earth, refashion the Earth with man's materials, so that man could profit in the construction of an alternate world, free from Earth's problems and limitations, and yet with all the aesthetic and life support functions of the real thing. Separate humanity forever from the Earth, and place them *within* the sphere, instead of outside it. Space colonies became new inverted Edens and they promised a return to a God-ordered garden of plenty where all was abundant and shame was absent, and immortality reigned. As inverted Edens, the colonies' appeal lies in their sense of enclosure, as if God's loving arms again embraced the Garden and protected its precious inhabitants. Eden now could exist where Hell was in the past, but in Heaven instead of on Earth.

Medieval and ancient Christian geology and theology, dependent on the conception of heaven and hell for spatial reference, may help explain the attraction of inverting the planet and help explain the misguided assumptions of bliss many rocketeers and space architects brought to their extraterrestrial structures. In seeking to create a technological analogue of heaven, thinkers like Tsiolkovsky, O'Neill, Oberth, von Braun, and countless NASA officials, often without understanding where their passion for weightlessness and spaceflight came from, *assumed* that space would be a benevolent locale. They assumed that weightlessness would be healthy and liberating. They assumed that bringing Earth-life into the solar glory of outer space would be easy. They

assumed that the wonders of the moon would inspire the creation of bubbles, bases, and colonies and that men would live there year round. They assumed that manufacturing in space would be profitable and that machines would perform better there than on Earth. This chain of assumptions was not science, but faith. Dazzled by the prospect of entering the cosmos, many of them had little template by which to imagine the above except for heaven. Heaven and space have always been conflated, confused, and combined. This confusion created a series of assumptions concerning the nature of the space environment which has since turned out to be false. If there is a heaven, it is not outer space.

O'Neill's attempt to create a proliferating series of metal hollow Earths across the solar system derives much of its psychological impetus from the ancient geometries and cosmic ideations of Christianity. In attempting to interiorize the natural world and human society in a self-contained bubble away from the planet, O'Neill hoped to save both the Earth and the human race. Yet one other characteristic of the Christian heaven becomes embedded inside the architecture of space colonies: the anti-democratic hierarchy of God and the angels which would rule the elect. Life inside a hollow Earth would be the realization of a project of centralized control first imagined by architect and philosopher Jeremy Bentham and later described by French philosopher Michel Foucault. The inhabitants of an interior Earth would be the subjects of the Panopticon, an architectural device which would allow a paternal bureaucracy to police those living within it. Like the denizens of the panoptical universe of Thomas Wright, the baleful eye of God would radiate its omniscience and omnipotence in all directions, seeing all and knowing all.

The next chapter will examine the ideology behind the most massive extraterrestrial engineering projects ever proposed. These projects would use O'Neill's colonies as a stepping stone to their fruition. If achieved, these products of the Christian panoptical inspiration would eventually shut the eye of the Earth on the universe and

instead remake the solar system and human existence in the image of a massive hollow planet surrounding a central sun. In some versions of these projects, the Earth itself would be cannibalized to supply materials for the construction of this enormous exo-panopticon. These projects represent the ultimate realization of the O'Neillian Earth inversion and the ultimate denial of the suitability of the Earth for future human habitation.

# 15: Forging the Metal Sky

In 1958, physicist Freeman Dyson wrote a document entitled "A Space Traveler's Manifesto," in which he explained why he was participating in the Orion project, an ambitious U.S.-funded Space Age scheme to power interplanetary spaceships with a series of massive nuclear bombs. "It is my belief that this scheme alone, of the many space-ship schemes that are under consideration, can lead to a ship adequate to the real magnitude of the task of exploring the Solar System," he wrote. He professed that he had faith in the government that their research would not be diverted for military ends. "We are fortunate that the government has advised us to go straight ahead for the long-range scientific objectives of inter-planetary travel, and to disregard possible military uses of our propulsion system…

> We have for the first time imagined a way to use the huge stockpiles of our bombs for better purpose than for murdering people. Our purpose, and our belief, is that the bombs which killed and maimed at Hiroshima and Nagasaki shall one day open the skies to man.[502]

In his 1979 biography *Disturbing the Universe*, Dyson admitted that he had been naïve, and that the Orion project was a monstrosity of pollution, apocalypse, and misguided ambition. He insisted that his motives had been pure. He participated in the Orion Project, he claimed, "only because I wanted to explore the universe, and there was no thought of murder in my heart." But his work at Livermore National Laboratory troubled the man who had been a pacifist prior to the Second World War. "I learned at Livermore that it was not possible to make a clean separation between peaceful and warlike bombs, or between peaceful and warlike motives. Motives in each of us tend to get mixed." While at Livermore, he soiled his own lily-white vision of his character.

[502] Cited in *Disturbing the Universe*, p. 112.

“The colleagues with whom I worked at Livermore were inventing devices that later came to be known as neutron bombs,” he admitted. Neutron bombs would make it possible to kill every living thing in a particular city or region, enabling a conquering power to move in and easily pick up the pieces of another’s civilization, even to the extent of moving friendly citizens in. “I helped them and they helped me. In two weeks I made friends with them and became to some extent one of their team.

> To that extent I share the responsibility for the existence of neutron bombs. After this experience I could never again honestly say that the bombs we wanted to use for Orion had nothing to do with bombs that are designed for killing people.

Dyson's 1979 mea culpa received acclaim and appreciative reviews. But Dyson's imagination for other spaceflight projects was no less sinister. Dyson's ultimate vision of what any advanced technological civilization would inevitably achieve would become known as the "Dyson Sphere."[503] Gerard O'Neill, in his 1974 *Physics Today* paper, had looked forward to the day when Dyson's concept would become a reality, and saw space colonies as the first step towards it. "Ultimately," O'Neill wrote, "colonization could take place in the entire sphere, $3 \times 10^{17}$ $km^2$ in area, that surrounds the Sun at the distance we have evolved to prefer (the so-called "Dyson sphere").[504] From a technologically deterministic worldview, Dyson imagined that any superior extraterrestrial civilization would construct a massive shell around their sun, to maximize the living area possible for an expanding population, and to collect the full power of the largest natural fusion reactor imaginable. Such a civilization would live as if inside a mechanical Earth, within living area 600 million times the surface of the Earth. The surface of this sphere would be constructed of an immensely strong metallic alloy, forged by cannibalizing all the available loose space matter, and even entire planets. From the Earth, if the Earth were

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[503] Dyson, F. J. "Search for Artificial Sources of Infrared Radiation," *Science*, 131, 1667 (1959).
[504] Gerard K. O'Neill, "The colonization of space," p. 38.

not mined itself into non-existence, the sphere would dominate the sky. However, a highly advanced civilization, as Dyson pointed out, might have no need for their home planet, given the joys of living on what would appear to be a vast, flat world, reminiscent of the flat-Earth imagination which dominated Middle Eastern religious cosmologies, including Zoroastrianism, Judaism, and for at least 1400 years, most of the Christian world. Such a hungry and overpopulated civilization would devour their home planet whole, turning the rocks, mountains and oceans of their mother world into material necessary for a grander world of endless resources and energy consumption. The asteroids, moons, and perhaps even entire planets would be destroyed in the quest to construct a utopian abundance for all.

Dyson pointed out that while a complete sphere would not emit any light, given the complete encapsulation of the now central sun, such structures could be detected in the infrared spectrum. Dyson's central assumption rests on the exponential growth and expansion of modern mega-technological processes such as the current widespread destruction of entire mountains through massive strip mining operations, which in themselves seek to devour the Earth, and turn the natural peaks of the American wilderness into material for the furnaces of a civilization always needing more energy, addicted to the inexorable desire for more *lebensraum*. No doubt such a civilization would be governed by massive technological concerns, dominating the sky night after eternal night, a round-the-clock forging of the shell an ever-present reminder to those entrenched in the land of their mother planet that soon perhaps, if desired by the majority of the inhabitants of the sphere, who by this time would be separated by generations of time from their roots on their ancestral world, the soil and rock under the feet of the earthlings would be forged in the extraterrestrial furnaces into a better collective use on a new, larger, manmade, interior, and hollow "Earth." On the home planet, if not

devoured, the sun would disappear, and the land turned into eternal night, cold and dead. Alternatively, if the shell was built at a further diameter than that occupied by the undevoured home planet, the night sky, the infinite universe, the spinning planets, the stars, galaxies, supernovae, comets, the constellations of time immemorial, the template upon which all the home planet's religions constructed their dreams, and saw in the slow turn of the firmament a permanence, an order, a beauty, and a set of eternal principles of the cyclicality of Nature and the Universe – these would disappear forever. The light pollution plaguing our skies, and our experience of the infinite, would be as nothing to an all-encompassing metal sky. In many areas of the Earth, there is virtually no more sky already, so we are not far from a permanent realization of this lack of celestial infinitude among vast swaths of the world's peoples.

Dyson was not the first person to imagine this evolution of industrialism into the creation of a massive interior "Earth." In *The World, the Flesh, and the Devil*, J.D. Bernal imagined spherical colonies, but he also imagined that an organizing civilization could conceivably not need energy and would "be indifferent to stars except as spectacles." However, he doubted this outcome. "…[I]f (and this seems more probable) energy is still needed," he surmised, "the stars cannot be allowed to continue in their old way, but will be turned into efficient heat engines." He opined that the "second law of thermodynamics," the bedrock principle upon which all modern physics since the mid-nineteenth century has been based, and that all processes run down, tend towards disorder and death, "will ultimately bring this universe to an inglorious close." But by "intelligent organization," which one would assume might require massive centralization of authority using mega-industrial concerns, "the life of the universe could probably be prolonged to many millions of millions of times what it would be without organization." In order to save the universe from this inexorable apocalypse, and slow the increase of entropy, and

thus stretch out time's arrow, Bernal surmised, civilizations might use their suns as massive nuclear reactors. But in concluding his chapter on "the World," Bernal believed that humanity would fundamentally change in the process of marching down this technologically deterministic road. "…[L]ong before these questions become urgent," he wrote, "it would seem impossible not to assume that man himself would have changed radically in this environment," evolving to a higher state of being capable of undertaking, dreaming, and making material such visions of a synthetic sky.[505]

While Dyson and Bernal's conceptions of a synthetic world constructed via extraterrestrial industry are the most academic explorations of the possibilities for the future of technological civilizations, the most popular and widely read extrapolations of this conception lie in the novels of Larry Niven and Jerry Pournelle, two of the individuals on the committee headed by General Daniel O. Graham who introduced the Strategic Defense Initiative-inspiring High Frontier concept to President Ronald Reagan in 1981. In the *Ringworld* novels of Niven, the humanity of the future lives on a massive constructed ring, located at what was formerly the orbit of the Earth, which has since been destroyed, along with every conceivable solid and gaseous body in the solar system for the material necessary to forge it. In Niven's first *Ringworld* novel, published during the waning Space Age, in 1970, the inhabitants of this 600,000,000 mile ring consist of 2000 different species of hominid, mostly pre-technological primitives, some with a faint idea that a departed race they call the Engineers left behind this manmade world, their whereabouts unknown, but assumed by the reader to be off across the universe somewhere, repeating the process at another star, their utter ascension complete. The split of the human species foreseen by Bernal, by Ehricke, by Dyson, and by Oberth is

[505] J.D. Bernal. *The World, the Flesh and the Devil: An Enquiry into the Three Enemies of the Rational Soul*. Second edition. pp. 30-31

translated into science fiction by Niven. The Engineers are the destroyers of Earth, and the constructers of the Ringworld, and they are the liberated and enlightened Supermans and Princess Leias capable of a virtuous and final departure from the planet of their species' genesis in Niven's novel. Left behind, on a new below, are the surfacebound ignorant, collapsed into barbarism, studied as if in an enormous hominid zoo by the free-floating non-terrestrial protagonists.

Jerry Pournelle, who has authored several books with Larry Niven, including the 1977 novel *Lucifer's Hammer*, about the imminent destruction of the Earth by a collision with a massive comet, and *The Mote in God's Eye*, about a post-apocalyptic Earth's encounter with a violent and invasive extraterrestrial race, was instrumental in writing key portions of Ronald Reagan's 1984 speech which called for a space-based missile defense system ringing the Earth, and saw the development of such a system as a military bootstrap for a broader human future in outer space. Both Pournelle and Niven continue to campaign to this day for the industrialization and militarization of outer space and human exodus from the planet. Pournelle and Niven's vision for the space frontier was an arena unapologetically ruled by a highly centralized bureaucracy of industrialists and militarists. The comparatively scanty jigsaw puzzle rudiments of the metal shell currently encircling the planet in the form of communications satellites, spy satellites[506], the odd spacecraft, and millions of pounds of space debris[507] is, in the imagination of

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[506] "There are more than 750 active military, commercial, and civilian satellites worldwide." *USA Today*, January 11, 2001. The Goddard Spaceflight Center lists nearly 5,000 satellites, dead or alive, in Earth orbit. Satellite Situation Report, September 1997.

[507] In a 1990 report, scientists estimated that 4 million pounds of space debris of various sizes then orbited the Earth, with at least 1.8 millions pounds of debris added each year. NASA's Orbital Debris Program Office charged with the mitigation of space debris in order to protect the space shuttle fleet, Space Station Freedom, and hundreds of satellites from --- different countries, estimates that "11,000 objects larger than 10cm are known to exist" and that the "estimated population of particles between 1 and 10cm in diameter is greater than 100,000." An estimated "tens of millions" particles of smaller than 1cm orbit as well. Most space debris orbits within 2,000 km of the Earth's surface, with bands of debris at the 800km, 1000km, and 1500km levels. "Above 1,000 km," the NASA site reads, "orbital debris will normally continue circling the Earth for a century or more." NASA has discussed using futuristic space technologies such as massive

Pournelle, merely the beginning of a grander metallic web future for a risen industrial humanity, free of the shackles of Newton's gravity, dominant, seemingly all-powerful to those below, regimented, and militaristic.

The Dyson Sphere and Ringworld both imagine that a highly advanced extraterrestrial civilization, such as that which humanity is destined, barring calamity, to become, would devour its home planet and forge the totality of the natural sun system into metallic inner Earths surrounding the home Sun. In these concepts is the ultimate realization of the will to planetary destruction and rejection of nature inherent in the Earth-abhorrent psychology of the rocketeer. It is also the realization of the will to planetary destruction and departure inherent in the Christian drama of the Apocalypse. Yet the encapsulation of the Sun in a band of forged metal, with life on the inside, is also the dream of the hollow Earth – only this Earth is now almost unimaginably enormous, with a vast lebensraum, its energy needs powered by a central fusion reactor suspended in the center called the Sun.

Both the hollow Earth of Dyson and Niven, and the precursors to this grander inner Earth vision, the encapsulation of the Earth inside a loose orbit of metal composed of missile defense, surveillance and communication satellites, spacecraft, space debris, and the odd space-based telescope, possess a similar psychological effect. Life on an Earth encapsulated becomes, for the risen, a Bernallian zoo; similarly, life on this Earth becomes, for those left behind, an existence inside an inverted panopticon – an *exo-panopticon.* For the larger hollow Earth structures surrounding the entire Sun, the central Sun becomes the observer, and those living on the ring the inhabitants of the Panopticon.

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tethers to gather this detritus or knock old satellites out of orbit. Such missions would, of course, require more investment in rockets and astronautic technologies. For more information see: http://sn-callisto.jsc.nasa.gov/

This phenomenon is repeated in the spherical and cylindrical space colonies of Gerard O'Neill.

The Panopticon was an architectural design pioneered by the eighteenth century reformer and father of Enlightenment utilitarianism Jeremy Bentham. From the outside, the panopticon looks much like a circular stadium would appear. From the inside, however, instead of the action occurring on a central playing surface as in a stadium, the perimeter of the edifice contains an orderly series of rooms, on a predetermined series of levels, and it is here that, from a central viewing station in the center of the building, all the activity in the various rooms can be centrally observed. Bentham imagined that his creation would be the perfect architectural instrument for prisons, schools, asylums, hospitals and factories. Michel Foucault, in his book *Discipline and Punish*, which examined the evolution of the prison in Western society, described the major effect of the Panopticon as an architecture designed "to induce in the inmate a conscious and permanent visibility that assures the automatic functioning of power." Instead of the dungeons in the ground formerly used to sequester the prisoner away from the sight of all, the Panopticon would make the incarcerated completely visible to the power which held them in their sway. "All that is needed, then," Foucault wrote, "is to place a supervisor in a central tower and to shut up in each cell a madman, a patient, a condemned man, a worker or a schoolboy.

> By the effect of backlighting, one can observe from the tower, standing out precisely from the light, the small captive shadows in the cells of the periphery. They are like so many cages, so many small theatres, in which each actor is alone, perfectly individualized and constantly visible.

At the same time, the Panopticon would allow anyone occupying the central tower to immediately see all the incarcerants, students, subjects, as animals in a circular zoo. The Panopticon would be constructed so that "[a]ny individual, taken almost at

random, can operate the machine: in the absence of the director, his family, his friends, his visitors, even his servants." All would be subject to the gaze and control of the central viewer, merely through the architecture of the edifice of Bentham's imagination. That each individual bears little chance at actually being watched at any one time is true, and yet immaterial. Such is the psychological nature of the Panopticon and its power. All cannot be watched at once, but all can feel as if they are being watched. It does not matter if one is being watched or not; one will be more likely to do as they are told if they merely *feel* as if they are being watched. According to Foucault, Bentham's principle inherent in the panopticon was that "power should be visible and unverifiable." Through a series of Venetian blinds, zig-zagging corridors, and tricks of light, the subject in the room would never know whether they were being watched, but "must be sure that he may always be so." Under such a system, Bentham imagined, the worker would diligently work, the schoolboy diligently study, and the asylum patient and prisoner keep out of mischief.

In the metallic encapsulation of the planet with satellites, commercial, scientific, and military, the beginnings of the shell of the ultimate panopticon take shape. This is not a panopticon on a localized scale, walled in from its surroundings, with all activity taking place unseen from the streets which front its ramparts, the power centralized within by the central tower scanning the interior of this closed society – this little 'earth' – but instead this is the ultimate panopticon, circumscribing the whole of terrestrial reality, with an elite group bent by whatever means to transcend it so as to control it from without. Here, the Panopticon, like the Earth in space colonies, is inverted, with the surveillance of society accomplished via remotely placed, weightless, technological eyes launched and maintained by a ruling power that still dwells on Earth, but ever mindful of the transcendent promise of escape from the controlling structure of their own design,

whether that escape be spiritualized in the form of the Rapture, or materialized in the form of space colonization and exploitation. The eye of the panopticon is diffuse, yet still centrally controlled. This is an exo-panopticon, with myriad eyes along the perimeter, still controlled by an unseen tower on Earth.

The hollow Earths of Gerard O'Neill offer a similar opportunity for panopticism, but on a more traditional scale. Many of the illustrations of O'Neill's colonies depict either a central tower, as in the spherical designs, or a central hub, as in the torus designs. In this hub exists the brain and control of the outer wheel; in the central tower, one can observe the entire colony. And certainly, no central structure is necessary to surveill a land mass as comparatively small as a space colony.

O'Neill's colonies also offer another form of panopticism, also diffuse. In his spherical designs, and in all hollow Earth motifs, the possibility of a universal panopticism is either designed or implied. Looking from one end of O'Neill's space colony to the other, one can see the backyard's and roofs of other colonists. In an inverted Earth, the landscape becomes a voyeur's dream, with no long-range obstructions from trees, mountains, or horizons. The psychological effect is one of closure, and the experience of panopticism means that paradoxically, everyone can feel as if they are the watcher and the watched. Whether this gives a sense of comfort or paranoia is perhaps up to the character of the individual colonist. But regardless of whether all in the colony feel that they are in the central tower and simultaneously on the perimeter, there is no doubt that a ruling structure necessary to maintain stability in a self-sufficient small-scale space colony might very well have a diffuse camera-surveillance exo-panopticon of its own. While the large-scale inner Earths of Dyson and Niven are so enormous such that visibility over the inverted horizon is impossible, and visibility across the entire sphere or ring is restricted to a celestial line or diffuse white concavity, the psychological effect is

still the same. And in the center, the Sun, identified with Christ since the dawn of Christianity, is the central God, the central Eye, casting all in its eternal, nightless glow. Just like the Eye of God in the center of Wright's spherical Milky Way, the Eye sees all.

The symbol of God's eye, common in Reformation-era Protestant art as a way of impressing upon the congregant the panoptical power of an all-powerful and timeless God of judgment, appeared in both Germany and England, characteristic of the Calvinist preoccupation with predestination and the depravity of mankind. The Information Awareness Office, a since-cancelled government body charged with implementing a program of "Total Information Awareness," in which information received by the government, including the credit card purchases of all Americans, would be mathematically analyzed to ferret out terrorist plots before they are executed, originally had a logo with the whole Earth on it. The logo features the unfinished pyramid of the Great Seal of the United States, crowned by an eye contained in a shining triangle. The eye was meant by Pierre Du Simitière, the consultant and artist on the first Great Seal committee in 1776 to represent "the Eye of Providence," and Secretary of the Continental Congress Charles Thomson, the designer of the Seal, intended the eye to "allude to the many signal interpositions of providence in favour of the American cause."[508] God's eye scans the Earth's surface, bathing one side of the planet in a yellow glow. Below the logo is the motto, "Scienta est potentia," or "Knowledge is power." God's eye is disembodied from the Earth, above it and lording over it. Satellite surveillance, and government surveillance and intelligence in general, in the logo, is represented by the eye of God. God, in the logo, is a spy satellite. The Office sought to use a symbol of God's watchfulness to represent American government surveillance of other nations and private

[508] *Journals of the Continental Congress, 1774-1789.* Washington, D.C.: Government Printing Office, 1914. pp. 338-340.

individuals, both domestic and international. The surveillance state is here not Big Brother, but perhaps something far more sinister – a technological interpretation of the omniscient judgment of a too-loving and too-ruthless Sky Father.

Another government agency with the symbol of Earth and God's Eye is the Air Force's National Reconaissance Office, the ultra-secret space-based intelligence-gathering and surveillance partner to the civilian NASA. Founded by President Eisenhower after the Soviet shootdown of Gary Francis Powers' U2 spy plane in 1960, the NRO was for 32 years the most secretive organization in the United States government. Verification of its existence did not come until its September 18, 1992 declassification. The Department of Defense, in declassifying the ultra-secretive agency, issued a terse four paragraph statement regarding who its top officers reported to in the U.S. government.[509] In 1994, the NRO declassified its logo, a color illustration of the blue and green whole Earth, encircled by a Saturnian ring representing the orbit of a spy satellite.

Today, the panopticon, designed to regiment society's institutions into conformity and supposed moral bliss, has become the totality of human terrestrial existence. In O'Neill's colonies, in the Dyson sphere, in the hollow Earths of Teed and Wright, in Larry Niven's Ringworld, just as in the proposed prisons, hospitals, schools, and towns under quarantine, the panoptical imagination governs the order of society and the rule of law. The central tower of the Panopticon, from which the warden can watch the prisoners, or the principal can surveil his students, has become diffuse through the extraterrestrial placement of dozens of Earth-facing microscopes – most as powerful as the Hubble Space Telescope, designed to magnify objects billions of light-years away. There is still

[509] Department of Defense Memorandum No. 264-M, September 18, 1992. See http://www.fas.org/irp/nro/dod091802.html.

a central tower for this Panopticon, from which the cameras are controlled, secretly, so that none but the warden can know who is being watched, and when. The peoples of the Earth are now not only surveilled through the institutions which have internalized the panoptical schema, but also in actuality within a global Panopticon. We are all – and this is not a paranoid delusion, but a material and technological fact – the possible subject of a powerful, unregulated, and secretive global surveillance superstructure run by the United States government. Indeed, with technology today, such powers are within the reach of several governments, although the United States is the clear leader.

In the disembodied extraterrestrial eye of the logos of the IAO and the NRO, the eye of the Earth is corralled and controlled. In the ring of space debris and satellites surrounding the planet today, the eye of the Earth begins to go dark, pieces of metal sent up to peer back down into its blue and green depths piecemeal blocking out the ancient experience of the sky. The encapsulation of the Earth's eye behind a blindfold of metal serves, if we are to assume that a structure like the Dyson sphere could be completed around a celestial body such as this planet or the Sun itself, conceptually and in material form, to completely black the night and perhaps blot out the sun, depriving those not in control of the levers of power of this vast spherical edifice of the inspiration and imagination of a full and endlessly imaginative cosmos. This *exo-panopticon* attempts to effect the realization of the medieval Christian walled city in totalizing form, and it succeeds in making material a world where one God, all-seeing, all-knowing, all-controlling, equal parts violent and merciful, is not able to be disproven through contact with cultures retaining different astronomical interpretations of the cosmic web.

The exo-panoptical consciousness seeks to extraterrestrialize the control of the Biblical God, imagined to be the only One True God, so as to brook all debate concerning reality, and engineer the perceived Truth and prophecy of the Book. Through the rocket

can be seen the metallic finger of God, as coming out of a cloud, destroying the Sodom and Gomorrah of Earth, bringing on the close of human history in a fiery bath of cleansing flame, and also the chance that one may grasp onto this finger, and propel oneself out of a messy, doomed, and imperfect world, into the blissful and perfect stasis of the celestial realm. This technology, as we have seen, was created almost wholly within a consciousness of the End, whether to avoid the inevitable destruction of the world by natural means, through colliding comets and asteroids, or through the heat death of the Sun, or even through starvation, disease, and the usual assortment of terrestrial conflicts, or such destruction by new manmade and technological means -- total warfare, aerial bombardment, and the nuclear flash. The assumption of the end is necessarily a fatalistic assumption, but it also the assumption of new beginnings. In the past century, many Christian thinkers, in encountering the world openly and without prejudice, have attempted to avoid the end of history not through technology, but by questioning many assumptions of the violent character of this end as receiving infallible support from the words in the Book. Instead, thinkers such as Paul Tillich and Peter Berger believed that the turning over of a new era could be seen in the context of a cyclical consciousness, one never alien to Christianity, just never dominant, and one which agrees largely with the cyclical insights of other cultures with sciences and beliefs more ancient than Christianity. The attempt to dispel fatalism, and provide hope, has been the cause of every religious-minded person since the dawn of humanity. But when this hope is directed towards an escape to the above founded in disgust with the below, it has created some of the most panoptical and claustrophobic political and spiritual regimes of our time. Nazi Germany, the Soviet Union, and the new and emerging dominance of the United States as the sole terrestrial superpower, have always threatened to exert this totalizing control through a common philosophy which had at its heart the will to escape.

But these were only regimes, for only a comparatively small cadre of individuals in each of these political entities ever truly adhered to the vision, and were always intensely paranoid about the discovery of the ever-humming dynamo behind their consciousness by the majority, and were and are insular, fearful, fatalistic, secretive, and hierarchical by necessity. But above all, and most dangerously, they are also supremely confident in the inerrancy of their vision, and together, unfortunately helped materialize the gravest threat to human existence and imagination ever crafted by the hands of women and men: the nuclear-rocket state, the machine state, the beginnings of the panoptical shell which would close the eyelid of Earth forever.

# THE RISE OF THE EXO-MILLENNIAL WAR GOD: MILITARISM AND FUNDAMENTALISM IN SPACE IN THE 1980S AND BEYOND

The apocalyptic dream of spaceflight did not die with the fading away of O'Neill's colonies from the public consciousness. A new group of standard-bearers took up the extraterrestrial millennial cause, only now the political constituency for space shifted markedly to the right. Spaceflight again became closely allied with a military enamored of proliferating apocalyptic technologies in response to real and imagined threats.

The O'Neill space colony vision presaged the rise of missile defense as the Republican Party's primary platform regarding the industrialization of space. Instead of construct O'Neill's increasingly expensive and impractical glassed-in space city/bomb shelters off of the Earth, why not create such supposedly invulnerable, nuclear-threatless communities on the Earth itself? Why not protect cities with a complex space-based missile defense system?

The comments of George M. Low, NASA Deputy Administrator from 1969 to 1976, shed light on the ideology behind both space colonies and the future missile defense system. Both of these massive technological projects were designed to protect, defend, and insulate the American people from the proliferating technologies of apocalypse which had spread to every corner of the Earth. The communities that these technologies would supposedly make possible would not be futuristic in the sense that human behavior would have to change; in fact, both projects anticipated the protection of an old United States – a United States of vast spaces and protected by great oceans which in the modern era had vanished in Pearl Harbor and at the World Trade Center. In remarks delivered at the Utah Air Force Association Bicentennial Program in April 1976,

Low predicted what kind of speech his counterpart would give at the "Tricentennial" program a hundred years hence. The space colonies of Gerard O'Neill would be set up by then, replete with "mountains, clouds, streams and trees," and these colonies would offer "a new frontier… the new hope for the future of humanity, the twenty-first century equivalent of nineteenth century America."[510] Inside O'Neill's colonies, as in inside the bubble-cities of a missile defense protected America, would sit, blissful and clean, a nineteenth century agrarian, friendly, home-based America on the edge of a boundless frontier. Seven years later, President Reagan would propose a missile defense system to help preserve such a fantasy of what America was, and could again be.

As a young Congressman, Newt Gingrich distinguished himself from his other Republican colleagues for his strong advocacy of futuristic technology and space issues. His pro-technological perspective seemed new and fresh, and the youthful utopianism of his conservatism complemented Reagan's fatherly image. The rise of the neo-conservative in Washington, D.C. heralded the beginning of a new form of extraterrestrial millennialism – one not founded on the apocalyptic and social fantasies of the counterculture, but one rooted in the militaristic contingencies of right-wing realpolitik.

In 1981, Gingrich praised the leadership of Reagan on the floor of the House of Representatives, and had a passage from space colonization advocate Ben Bova read into the Record. "I commend this passage and the entire work to my colleagues," Gingrich said. Bova's passage, from his book *The High Road*, represents the most extreme example of extraterrestrial millennial ideology in the work. "All of the people of Earth are in a desperate race against global disaster," Bova claimed.

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[510] George M. Low, "Salute to NASA," Remarks at Utah Air Force Association Bicentennial Program, Salt Lake City, Utah, April 23, 1976.

> The end of civilization is in sight, now, in the smoking streets of Tehran and Belfast and Miami, in the starving masses of Sahel and Cambodia, in the nuclear arsenals and imperial ambitions of many nations. Only by raising our sight above the immediate problems of the moment, only by reaching outward into space itself, can we avert the coming worldwide collapse of civilization and the deaths of billions.[511]

In 1980, the L5 society, begun to support O'Neill's dream of space colonization, was lobbying its members to phone their representatives to oppose such broadly popular United Nations initiatives as the Moon Treaty, which would have internationalized the moon. The Society hired Washington lobbyist Leigh S. Ratiner, who formerly had lobbied on behalf of the mining magnate Kennecott Copper Corporation in Law of the Sea negotations, to urge elected officials to oppose the seemingly benign treaty on the grounds it would prevent the commercialization and corporatization of space.[512] The O'Neill-inspired society entered the 1980s as the most active and dynamic space group, and the move to the politicial right by their constituency paralleled O'Neill's move in that direction as well. While the space colonies were initially modeled after a countercultural and ecological aesthetic, once the 1970s era had fallen out of fashion, and once the ecological sustainability of space colonization became a subject of serious scientific and technological skepticism, space colonization advocates completely ceased trying to appeal to environmental and politically left constituencies. As O'Neill moved away from his initial dream of commune-inspired and Edenic space colonization, and towards a more technocratic vision of large-scale space industrialization, the L-5 Society followed. For those committed to the dream of entering space at all costs, pragmatism dictated that a political reorientation was in order. While it is certain that Reagan's victory in 1980 was the product of many constituencies moving to the right, the movement of space advocates in this direction was particularly striking for its abandonment of universalist

[511] Hon. Newt Gingrich, "The High Road to Space," in *Congressional Record*, October 1, 1981. p. E 4558.
[512] "Citizens for Space," *Science*. Vol. 211. January 9, 1981. p. 152.

and brotherhood space rhetoric – popular since the dawn of the Space Age – and towards a militaristic, regimented, nationalistic and adversarial set of justifications for the conquest of the sky.

The conservative revolution sought a return to American values, and by 1980, the Space Age was seen as part of that nostalgic and family-oriented 1950s Cold War past that conservatives sought to resurrect. Between 1981 and the Challenger disaster in January 1986, conservative space advocacy entered a period of fashionability in Washington, largely due to the technological utopianism of the Reagan White House. The defeat of O'Neill's countercultural space colonization experiment was met not with a repudiation of the apocalypticism which served as its rationale, but with instead a revival of the intense nuclear anxiety of the years between the launch of Sputnik and the Cuban Missile Crisis. The atomic brinksmanship of Reagan, in which he brashly toyed with a strong-armed nuclear diplomacy, created the climate of fear necessary to again look to the desacralized American heaven for signs and promises of an extraterrestrial millennial dawn.

The launch of the space shuttle became the Reagan administration's major extraterrestrial achievement, but by 1981, the shuttle was already a relic of an older program. And the space shuttle was a bit like a bus: boring and pedestrian. Instead, the Reagan administration's vision for the space future involved two extraterrestrial millennialist fantasies: the colonization and settlement of the moon and Mars, and the militarization of near-Earth space with a high-tech fleet of missile-killing laser satellites. The first vision of space merely resurrected the same tired dreams of the heyday of the Space Age, but the second one introduced an entirely new element of fear and claustrophobia into the very experience of living on Earth.

Of all the American Presidents before or since, Ronald Reagan was perhaps the truest believer in the spacebound dream, and perhaps the only President with the sincerity of conviction to pull it off. As historian Frances Fitzgerald has observed, Reagan's genius was that he could speak in two different languages, both resonant with a public steeped in the rhetoric of Christian millennialism. Reagan, Fitzgerald maintains, spoke in both pre-millennial and post-millennial tones, simultaneously warning darkly of the coming Armageddon all-but-destined to engulf the globe, while also promising that with a stable and continual march with righteousness that American society would attain a Christian perfectionism suitable for the return of the Messiah. Reagan's approach to space mirrored this rhetorical tightrope he effortlessly walked throughout his Presidency – on one hand he sought to ring the Earth with space-based weaponry and surveillance, thus literally squeezing the Earth technologically, and on the other he expressed a fervent belief in the future liberation and release attendant with the human breakout into space. Like von Braun, Reagan used fear and coercion in equal measure with fantasy and dream. And like von Braun, Reagan never admitted to the dark circularity of his extraterrestrial millennial beliefs: create the means by which Earth will be uninhabitable, and then offer a fearful and anxious people the means to escape their terrestrial prison. It is doubtful that he even understood the paradox, so embedded must it have been in his own psychology.[513]

Fitzgerald's analysis of the policy decisions which went into Reagan's advocacy of the Strategic Defense Initiative is perhaps the only scholarly work to directly address Reagan's extraterrestrialist proclivities. This is a tremendously understudied aspect of Reagan's personality. Reagan's extraterrestrialism was directly tied to his millennial and evangelical beliefs, beliefs which he partially inherited from his mother, Nelle, who while

[513] See Frances Fitzgerald. *Way Out There in the Blue*. New York: Simon and Schuster, 2000. p. 36-37/

born a Catholic, joined the Disciples of Christ Christian Church a year before her son's birth. The Disciples of Christ, while adhering to a relatively close literal reading of the Bible, eschew the premillennialism and rapture theories of their Pentecostal and fundamentalist brethren. Nelle Reagan was a committed member of her church, often ministering to the underprivileged of the community, and there is no indication that end-times beliefs were actively bandied about the Reagan household.

However, on several occasions before and during his presidency, Reagan evinced a strong belief in the theology of an imminent Apocalypse. Reagan's close National Security Council advisor, Robert McFarlane, claimed that the President's desire to protect the American people from nuclear attack stemmed directly from a Biblical interpretation of contemporary troubles. In his memoir, McFarlane wrote that Reagan "was convinced that we were in fact heading toward Armageddon, the final battle between good and evil." McFarlane quoted Reagan as saying, "I'm telling you, it's coming. Go read your Scripture."[514] As governor of California, Reagan himself made no secret of his fatalist apocalyptic faith. In 1971, at a political dinner in Sacramento, he told the gathered guests that a recent leftist coup in Libya was "a sign that the day of Armageddon isn't far off… Everything is falling into place. It can't be long now. Ezekiel says that fire and brimstone will be rained upon the enemies of God's people. That must mean they'll be destroyed by nuclear weapons."[515] A little over a decade later, as President, Reagan ordered the bombing of Muammar Khadafy's palace in Tripoli. And in 1983, he told an Israeli lobbyist, "I turn back to your ancient prophets in the Old

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[514] Robert C. McFarlane with Zofia Smardz. *Special Trust.* New York: Cadell and Davies, 1994. p. 228.
[515] James Mills, "The Serious Implications of a 1971 Conversation with Ronald Reagan: A Footnote to Current History," *San Diego Magazine*, August 1985. p. 141. Cited in Boyer, *When Time Shall Be No More*, p. 142.

Testament and the signs foretelling Armageddon, and I find myself wondering if we're the generation that's going to see that come about."[516]

Such views were not only held by Reagan, but by the most prominent members of his cabinet. In 1982, his Secretary of Defense, Caspar Weinberger, told a *New York Times* interviewer that he had read the Book of Revelation. "[Y]es, I believe the world is going to end – by an act of God, I hope – but every day I think that time is running out," he said. "I think of World War II and how long it took to prepare for it, to convince people that rearmament for war is needed. I fear we will not be ready. I think time is running out… but I have faith."[517] Weinberger, an avid supporter of the second Bush Administration's policy towards Iraq, expressed a steadfast belief in an imminent Apocalypse, a stunningly violent and horrific war to end all wars. Even Reagan's appointee in charge of ensuring the health of the nation's public lands, Interior Secretary James Watt, evinced little hope for the use of those lands by subsequent generations during his confirmation hearing before Congress. "I do not know how many future generations we can count on before the Lord returns," he said.[518]

Concern in the American media over President Ronald Reagan's apocalyptic beliefs was so strong during the 1984 election campaign that journalist Marvin Kalb asked the President, during a live televised debate, what his beliefs were concerning Armageddon as prophesied in the Bible, and whether they influenced his policy. Nancy Reagan, present and watching the debate, was heard to mutter, "Oh, no." Reagan shakily denied in his answer that his policies were influenced by millennial prophecy, although

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[516] Wolf Blitzer, *Jerusalem Post*, October 28, 1983. Quoted in Boyer, *When Time Shall Be No More*, p. 142.
[517] "The Religious Right and the New Apocalypse," *Boston Globe*, 2 May 1982.
[518] *New York Times*, 23 August 1982.

he expressed sympathy with a "number of theologians" who believed that "the prophecies are coming together that portend that."[519]

At some point in Reagan's life, he inherited a mild to strong form of millennial belief, probably through a combination of his exposure to Republican Party fundamentalist constituencies and his mother's literal Biblical beliefs. There is enough circumstantial evidence to suggest that his exposure to fundamentalist beliefs concerning the Rapture and Armageddon influenced his decision-making process in regards to both nuclear weapons and spaceflight.

By 1984, space advocacy groups were lobbying fervently for the re-election of Reagan. "We couldn't have come up with a better contrast," said Tom Frieling, director of Campaign for Space, "between a Democratic candidate who tried to kill the space shuttle 10 years ago and a President who is an absolute space nut."[520] The Republican Party platform that year included strong statements of support for both traditional space exploitation schemes such as a space station and industrialization, as well as for Reagan's new brainchild, the Strategic Defense Initiative.

Reagan proposed the Strategic Defense Initiative due to his strong desire to protect the American people from nuclear attack.[521] His solution to this threat from above was simple, and torn from the pages of a 1950s science fiction pulp: shoot down the missiles with a super-futuristic array of laser satellites. In her book, Fitzgerald notes that the impulse for a space-based missile defense system was primarily ideological, born of a paranoid streak in American conservatism which saw all foreign interlopers as possible Antichrists. One of Reagan's first exposures to the idea was through a White House meeting with hydrogen bomb inventor and nuclear rocketry proponent Edward

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519 Cited in Paul Boyer, *When Time Shall Be No More*. p. 142.
520 "Political Showdown on Space in Fall Foreseen," *New York Times (AP)*. August 19, 1984. p. 28.
521 See Frances Fitzgerald. *Way Out There in the Blue*. New York: Simon and Schuster, 2000.

Teller. Teller, a Hungarian émigré and a virulent anti-Communist, was obsessed with the dream of advancing science in the cause of avoiding apocalypse. Richard Rhodes said of Teller and fellow hydrogen bomb creator Stanislaw Ulam, "They came to America and devoted themselves gratefully to inventing weapons, thinking to make their adopted country more secure; instead, as in old tragedy, they extended the conditions of their critically unstable Central European past across the earth: the pressure became universal, the insecurity general, the dark unusual spilled forth at every hand, the human world faced extinction."[522] A Los Alamos colleague of Teller's claimed the divisive yet charismatic scientist had a "messianic complex," and Atomic Energy Commission head Sumner Pike called him a "missionary" in his near fanatical zeal to create a "superbomb."[523] Teller not only advocated for the construction of the hydrogen bomb, but suggested that nuclear explosions be used to effect massive geo-engineering projects on the scale of the Zoroastrian apocalypse, such as the construction of a new canal across Central America, and the leveling of inconvenient mountain ranges. "If your mountain is in the wrong place," Teller told an Anchorage, Alaska newspaper in 1959, "Just drop us a card."[524] His colleague in developing the superbomb, Stansilaw Ulam, headed the Orion Project, a U.S. government research project to look into the use of rockets powered by thermonuclear explosions. Teller was a fervent proponent of space exploration and spaceflight, although his real interest was in the employment and proliferation of nuclear weapons on Earth.

While Teller's meeting with Reagan is widely acknowledged, less publicized was the influence of science fiction authors Jerry Pournelle, Robert Heinlein, and Larry Niven

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[522] Richard Rhodes. *Dark Sun: The Making of the Hydrogen Bomb*. New York: Simon and Schuster, 1995. p. 580.
[523] Rhodes, p. 462.
[524] Quoted in *Anchorage Daily Times*, June 26, 1959, p. 11. The film *Nuclear Dynamite* traces the history of this scheme. See http://www.facetofacemedia.ca/ndinfo.html.

on the development of the Strategic Defense Initiative. In 1980, Pournelle, a dedicated supporter of right-wing Republican causes and space colonization, cobbled together a private citizen's space advocacy group called the Citizens' Advisory Council on National Space Policy. Composed of his science fiction author friends, various space industry personalities, retired general and former head of the Defense Intelligence Agency Daniel O. Graham, and Apollo 11 moonwalker Buzz Aldrin, the group sought to influence the Reagan administration to create a profoundly futuristic space program. General Graham was a consistent supporter of a militaristic space program who in 1981 authored a Heritage Foundation report, *The High Frontier: A New National Strategy*, in which he advocated the dual militarization and industrialization of space through investment in a complex array of laser-guided defense systems. Graham's plan called for not only conventional and laser-based defense systems but also for a manned, military space plane, an upgraded space shuttle, a manned low-Earth orbit space station, and a solar power satellite system similar to that proposed by O'Neill.[525] In essence, Graham's plan represented the dark side of O'Neill's vision – instead of the humanization of space, Graham sought the conquest of space by the U.S. military.

Pournelle supported Graham's plan, believing that space colonization could piggyback on the military's budgetary largesse and penchant for funding and supporting huge space projects such as the Mercury, Gemini and Apollo projects. The section of Reagan's March 1983 speech which dealt with SDI was even written by Pournelle.[526] Again, the dream of escaping the Earth through techno-Rapture became allied with the militaristic dream of forging the weapons of the Apocalypse. While ostensibly military, commercial, and irreligiously extraterrestrial, the plan bore all the hallmarks of the exo-

[525] Daniel O. Graham. *The High Frontier: A New National Strategy*. Washington, D.C.: The Heritage Foundation, 1981.
[526] Norman Spinrad. "Too high the moon," *Le Monde diplomatique*. July 1999. http://www.en.monde-diplomatique.fr/1999/07/14star.

millennialist fearmongering and protective rhetoric consistently characteristic of justifications of space exploration.

Reagan truly believed in the utopian possibilities of space travel, and in his Strategic Defense Initiative, he sought to militarize space so as to protect the American people for ages to come. Reagan used the limitless frontiers of space to political and rhetorical advantage better than any President since Kennedy, despite a marked change in rhetoric and tone. While his successors would variously attempt to resurrect the vision of space as an instrument of patriotism, Reagan would be the last to do it successfully. Clinton would barely try; the two Bush presidencies would try to mimic Reagan's bold approach, but with little success, and even to their detriment.

The Strategic Defense Initiative attempted to bring the static heaven of O'Neill's colonies down to Earth, by creating virtual bubble cities and a virtual bubble of protection over the entire nation. Like the New Jerusalem the Puritan forebears had imagined the New World would someday be, American under the protection of a space-based missile defense system would be inviolable, free, and safe. Like O'Neill's colonies, Reagan's vision of an America protected approximated a nineteenth century agrarian village dream, where sound morals and neighborliness were supposedly the standard for society. And like nineteenth century America, this new bubble America would be cut off from the rest of the world, blissfully free in its own ignorance of the violent and damned world raging about it.

Neither O'Neill's colonies nor the Strategic Defense Initiative would ever prevent the imagined apocalypse, and paradoxically, both would probably bring it that much closer to realization. The conquest of the sky, either through colonization and its attendant transportation and satellite technologies, or through SDI and the ringing of the Earth with laser guns cocked and ready to blow any transgressors out of the heavens, is

inextricably rooted in the imagined conquest of the Earth. The vicious Earth can only be subdued from above, so it stands to reason that those that seek to control the planet seek to gain the high ground. Reagan's dream was to arm the heavens and subdue the Earth's governments and thus achieve world peace.

The union of space advocate and fundamentalist constituencies behind Ronald Reagan marked a comfortable turn back to the right for exo-millennialism. Since the extraterrestrial technocratic fantasies of Federov and Tsiolkovsky in Russia, the aim of space travel has always been connected with increasing militarization, regimentation, and automation. The powers necessary to exodus the planet were never possible for the individual, but only for a well-organized and hierarchical central authority. The nations that have established successful space programs have primarily done so only through an emulation of military hierarchy.[527] Nazi Germany, Soviet Russia, Cold War-era America, and now, Industrial China are the only entities to develop rocket programs of lasting importance and rocketeers capable of sending humans into space. While American fundamentalists often evince an other-worldly attitude towards current events, dismissing them as merely existential messages from God heralding the 'signs of the times,' militarism, fundamentalism, and the sky have always found common ground. Military hierarchies, with their strict attention to obeisance and regimentation, emulate fundamentalist hierarchies of which God's word is the one and only law. With today's military more dependent on control of the skies than ever before, fundamentalists have found common ground in this spatial orientation.

In 1988, in a strongly worded speech to the employees at NASA’s Johnson Space Center in Houston, Reagan called for a renewed effort for the colonization of space. “It

[527] The European Union's space program is a notable exception.

is mankind's manifest destiny to bring our humanity into space, to colonize this galaxy," he thundered to the cheering employees.

> Mankind's journey into space, like every great voyage of discovery, will become part of our unending journey of liberation. In the limitless reaches of space, we will find liberation from tyranny, from scarcity, from ignorance and from war. We will find the means to protect this Earth and to nurture every human life, and to explore the universe… This is our mission, this is our destiny.[528]

Reagan's words resonate with secular rapture imagery: the "unending journey of liberation,"; "the limitless reaches"; "liberation from tyranny, from scarcity, from ignorance, and from war,"; "nurture every human life," and "destiny." This is the language of Christian heavenly utopianism, made to appear as if space exploration will be engaged in by everyone on the planet someday. Everyone, in Reagan's speech, will be raptured into space. But this will clearly not be so. The Rapture will never be for everyone, but only for those who obey, who follow, and who submit. Those left behind on the Earth are offered protection, and the vague promise of "nurture," but it is the spacebound chosen in this vision who will be the heirs to the heavens and the future lords of the Earth.

[528] Ronald Reagan, "Text of Remarks by the President to Employees at NASA's Johnson Space Center," Transcript, Office of the Press Secretary. September 22, 1988.

# CONCLUSION

Heaven and outer space are not the same thing. Yet popular conceptions of outer space resemble in many ways characteristics commonly identified with the Christian heaven. The joy of weightlessness promised by space pundits for astronauts resembles the bliss of angelic flight promised by preachers for the raptured elect. The troubles on Earth which necessitate for O'Neill and others a human exodus to the stars resemble the troubles prophesied to precede the apocalypse and the Second Coming of Christ. The extraterrestrial garden cities promised by space colony advocates resemble visions of heaven as old as Christianity itself. And the future destruction of the Earth is regarded as inevitable by both extraterrestrial millennialists and Christian fundamentalists.

These commonalities bear testament to the thread which unites modern expectations of the benefits of human spaceflight with the perennial dreams of the Christian devout. While heaven and space are not the same, the similarities and congruences present in their popular conceptions are impossible to ignore. An understanding and analysis of such similarities can help to highlight the point at which our modern dreams of a human future in space depart utterly from reality and enter the realm of distant, and perhaps unattainable, fantasy. Such an analysis can also help citizens realize when those in positions of military and political power are cloaking the manufacture of weapons of mass destruction within the guise of creating the means of materializing a religious myth.

The rocketeers of Germany, Russia, and the United States justified their work as necessary to help humanity escape the planet before its demise. These justifications were not mere rhetoric to excuse a lifelong obsession with synthesizing explosives. These justifications were part of a definite faith which adopted most of its key tenets and

mythos from ancient Christian dreams of departing the Earth in emulation of Jesus's ascension post-crucifixion. This faith, which I have called extraterrestrial millennialism, helped to valorize the proliferation of intercontinental ballistic missiles during the Cold War and today continues to justify the militarization of a vast area encircling the Earth a mere 100 kilometers above.

If the only dream that O'Neill's colonies and NASA hoped to realize was the creation of a transcendent heaven in the here and now, then few would, from this simple dream, not sympathize with their aims. Many Americans imagine heaven to be their destiny and reward for toiling on the Earth. By conjuring up the image of a spacebound future for humanity, NASA fulfills a role that in the past was filled by theologians. By continuing to propagate the vision of an imminent human breakout into space, NASA assumes the role of the theological and prophetic wing of the American government. NASA continues to propagate this vision even in the face of overwhelmingly vast obstacles to its fulfillment. Space will not be conquered by American ingenuity, because it can never be truly conquered at all. But for many the vision of an American destiny in space fulfills the older Christian function of a destiny in heaven.

The older heaven upon which O'Neill's colonies took shape provide insight into how life in the colonies would actually be. The colony-heaven would be hierarchical, tightly regimented, and largely closed off from the cosmos. Personal initiative would be low, as the static societies which O'Neill imagined would survive best in the colonies mitigate against personal achievement at the expense of the whole. Colonial matters would have to be settled by a powerful central authority God which would have the final say in all disputes. Perhaps the colonists, as the risen saints, would be weightless. Perhaps there would be beautiful gardens, and beautiful architecture, and eternities of good health to enjoy them. But behind it all, the colonies would also be factories, run by

some form of clock, a clock perhaps set against a simulated day and night. These factories would run constantly, the colonists constantly dependent on factorial output, and their input, to provide them with the goods they need to trade and survive. It would not be a medieval heaven of leisure, but perhaps a heaven of industry run by a Deist clockmaker God. Like a clock, the colony would turn round and round once wound, the colonists moving to the beat of the rotation and their duties.

Cut off from the cosmos as if in another dimension, space colonies would fulfill the New Jerusalem prophecy of a self-contained, self-sufficient, hierarchical and celestial wonder city, lit from within. But the entrant would have to submit, without question, to a governing authority, their faith placed in the hands of those possessed of the bigger picture, and the entrant would have to reject forever the Earth which they left behind. In this choice between heaven and earth, decided so often in the fantasy of the oppressed in favor of heaven, and at the expense of maintaining and nurturing the Earth, the choice would be final and consequential.

The final event that would force the filling of heaven to capacity – the Apocalypse – is also the event that would drive Earthlings into space colonies. The threat of this coming day, made real by the rocket, itself crafted by men who thought that in creating it they were forging the vehicle to deliver them from the inevitable Hell on Earth, motivates space colonization and space conquest. The space colonies would be served by rockets, blasting off from the Earth dozens of times a day, bringing load after load of new arrivals to their city in the sky. These rockets deliver the colonists from the destruction for which the rockets were originally intended.

O'Neill fancied himself the creator of a metal wonderland, a heaven, but the rocketeers merely fashioned themselves lifeboat captains at best and weapons designers at worst. At least O'Neill was just their naïve byproduct, a man who did not recognize

that in dreaming of the architectures of transcendent deliverance, he was building them upon the bedrock of a Christian apocalyptic drama that the rocketeers understood all too well. O'Neill believed in the spacebound dream but he did not fashion it or create it. The rocketeers, justifying their work in the creation of weapons of mass destruction, tried to believe that what they were really doing was making not Apocalypse, but Rapture. They could not escape from the conceptual box into which they were born. Technology, to them, was determined, evolving, mindless, a creation above humanity in many ways, awesomely powerful, and willful. To this God they prostrated themselves, believing that by doing good work for the authority under which they toiled, they would necessarily be doing good work in the eyes of the God that seemed to condone the proliferation of such technologies. They had faith that their work would be for the good, tried hard not to think of the bodies of children lying in the rubble of London's East End, and prayed that they would be forgiven through the transformation of their technologies of apocalypse into technologies of rapture.

The greatest achievement of the rocketeers was the one they did not recognize or foresee, and which many never accepted. They gave humanity a new Earth. Although misguided in their vision of the future, standing at the culmination of centuries of confusion surrounding the alienating effects of technology described as an inexorable instrument of God's will for the world, the rocketeers provided the Earth with a new vision of itself. This new vision may shape our future in ways that the rocket no longer does. The Earth Age is still in battle with the Ages before it – Nuclear, Rocket, Space – but it has a much more compelling role for humanity in the future. Only the Earth Age vision of the future even sees a future for humanity on Earth, and this should be reason enough for its lessons to be taught.

To criticize certain of the assumptions that pervade the technology and science of spaceflight is in no way to condemn spaceflight altogether. To reject spaceflight is tantamount to rejecting possibility. The possibility for exploration is there. Yet for many centuries, certain form of technological development have been predicated on a form of eschatological wish fulfillment, and the ideology behind the development of technology has created the technologization of the mythic aspects of the prevailing religion. Rocketry has become one of the primary technological instruments of the metallicization of that mythos, from the conception and proposed construction of a New Jerusalem in the heavens, as in O'Neill's space colonies, to the establishment of a "God's-eyes" network of surveillance satellites ringing the globe. In the Strategic Defense Initiative, we are protected by this extraterrestrial God; in the spy satellites we are watched and judged in the light of his omniscient gaze. Our technologies merely reflect our beliefs about the world and about the viability of the world. Perhaps if we lived on a "good" Earth, the technologies which could truly sustain spaceflight, and space exploration could be fashioned without the fear that they would destroy the planet in the process of trying to leave it. We might not know what these technologies may be, but if there is anything the human race needs more of, and which it has less of in these times of seeming crisis, is patience. If we have faith in the birth of generations to come, what then could be the rush into space except an eschatological and escapist one, dreaming that we have not the intelligence to control the machines we have made, as if they have minds of their own and do not bear the imprint of their creator. We have the patience to generate technologies of spaceflight which are beneficial to man's survival and not dangerous to it. Truthfully, we really don't have another choice. Can we get into space only on the back of a rocket? Or are there peaceful technologies, sustainable and appropriate, which can ferry mankind someday to the stars? Or is the escape from Earth a truly Biblical project,

but not a project of the rapture, but a project such as the Tower of Babel, doomed to fail due to the hubris of man? For the time being, rational thought informs us that the self-fulfilling prophecy of escape and apocalypse inherent in exo-millennialism must abate if our civilization is to survive.

Perhaps the saddest irony of our modern age is this. All cultures and all religions have looked to the sky for the imprint of the supernatural, a sense of the beyond. In the sky we can see comets, stars, planets, asteroids; we can now see galaxies melting into other galaxies, quasars at the edge of an expanding universe, far in the distant past; meteors bruising Jupiter, and dust-storms on Mars. The wilderness of space is the true lesson for humanity, and as with wildernesses on Earth, we must take care what transportation we take within. Not because our technologies may harm space, but that they may harm Earth, which is in space. The Earth is a part of space, and this being the lesson of the Apollo missions, mankind's first foray to another celestial body, we must realize that space is a kind of Earth as well, fragile, sacred, unknowable in some perfect way.

The importance of spaceflight in Western psychology should not be underestimated. Spaceflight, at the height of the modern era, represented the ultimate achievement of technological man. To leave the Earth, the sphere upon which all known life in the universe exists, and proceed to colonize the cosmos, represents a radical break from all known terrestrial existence. To compare the conquest of space with the conquest of the ocean, as many spaceflight advocates and rhetoricians have done, is to be ignorant of the one basic truth which mitigates against massive space colonization and conquest: outer space is apparently dead. No life, as far as our space probes and astronauts can tell, exists anywhere else in the solar system, or for that matter, anywhere else in the universe. Life is, at least in our own cosmic neighborhood, quite rare. In western culture, this is a

thoroughly recent revelation. Whether one looks at the population of the cosmos with the angels, archangels, cherubim and other intermediary quasi-deities of the medieval Christian conception of the extraterrestrial realm, or at the modern era's expectation and rationalization that the heavenly bodies must be "useful" under God and thus populated with beings very much like humans, there has been no point in the history of Christendom that the regions outside the planet's atmosphere have been conceived as empty and lifeless. It is only with the initial explorations into space of the past half century that the Earth has been conceived as so precious and unique as to be the only bastion of life. The failure of each new robotic planetary probe, the crash of each manned space shuttle, and the inability of every telescopic glimpse into the universe's nearly infinite past to detect other lifeforms – each of these frustrations places the spaceflight endeavor, the ultimate material attempt by modern man to find commonality and comfort in the silent and starry night, in jeopardy of being considered meaningless. And each failure brings Western man to one perhaps frightening, perhaps alienating, but perhaps irrevocable and perhaps ultimately comforting truth: the Earth is all we have.

Such a revelation also places in jeopardy the promise of the Christian millennial drama: that the imperfect Earth, envisioned during the medieval era and beyond as the container for a pernicious netherworld called Hell, will – and should – someday be cleansed of its nature by a righteous fire from heaven, thus freeing the blessed from their temporary state of mortality. The religious undertones of the spaceflight endeavor are not only vital for understanding the challenges faced by a mankind now possessed of technologies of terrifying and apocalyptic power; the possible fact of the emergence of a techno-Christian sense of *anomie*, the threat of spiritual emptiness which need accompany this failure to discover an extraterrestrial purpose, poses a danger for all the peoples of Earth. Not all subscribe to the western Christian adulation of technological

achievement, yet all on Earth are today subject to its fate, and the fate of its philosophical trajectory. For if there is nowhere to go but Earth, one is left with one of two hard choices, if one believes, or lives within the effects of the Western Christian consciousness as we all do: one resigns oneself to the bounty of the land in which one finds themselves, or one resorts to an anxious and exclusivistic attempt to make real the Earth-denying Christian apocalypse through those technologies already forged. Perhaps, in this view, only through collective annihilation can the prophecy be fulfilled. The anxiety of anomie can create a form of "settling in" to the Earth, with an attendant turn to a more cyclical view of life in emulation of the natural world, or such anxiety can result in the horrors of collective suicide, homicide, genocide, and terra-cide, in the hopes of attaining a promised spiritual transcendence post-apocalypse. The choice is ours.

In the end, human will determines technologies, not some unseen force like God, Fate, or an extraterrestrial civilization. Technologies do not determine history, people do. People create technologies to fulfill perceived needs based on a set of philosophical and religious beliefs, and these technologies, in turn, are used in manners typically conjunctive with the fulfillment of the perceived needs, and are embedded with the philosophy that brought them about. Not only is belief in the power of people to shape history an alignment with historical fact, and not religious fancy, but belief in the power of people to shape history, even if it be only a choice between beliefs, is always the more preferable option. We can choose to believe in the kind of Earth we want to leave our children, and in our belief, the technologies to create that reality will materialize, not as if by magic, but by simple will and ideas. Apocalyptic technologies are symptoms of a human mental illness. We cannot escape the Earth we have made, and we cannot escape our technologies, but we can cease to believe in their power over us, and over our children. Time heals all wounds, and if we cease to believe in the rocket and its power to

set us free from the apocalypse it threatens to wraught, perhaps it can sit, year by year, rusting into dust, back to the Earth from which it came. And if we desire to rise up to the stars, perhaps we can go quietly, as a hiker in the wilderness, with technologies appropriate to the journey, and respectful of the habitat left behind.

# Appendix A

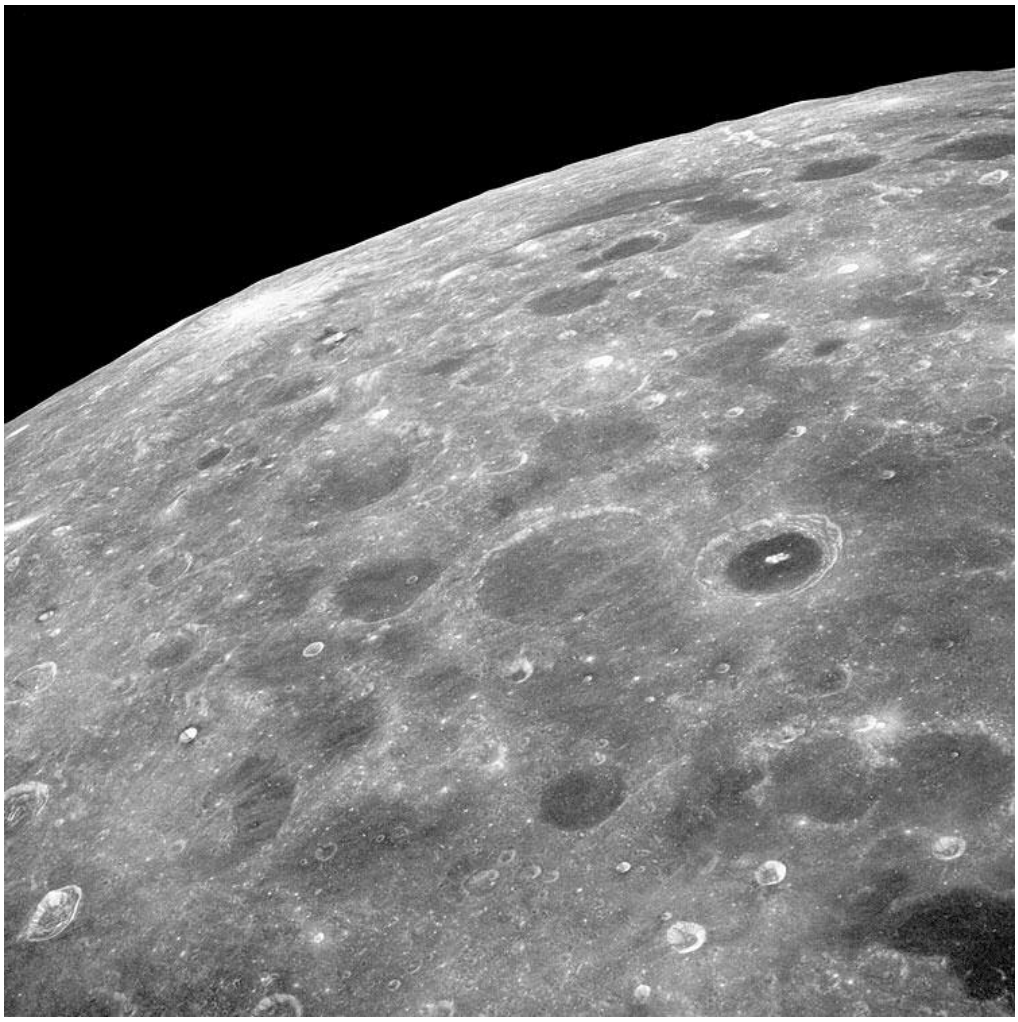

Illustration 1: The far side of the moon, Apollo 8, December 1968.

# Appendix B

Illustration 2: Earthrise photograph, Apollo 8 mission, December 1968.

# Appendix C

Illustration 3: Whole Earth photograph, Apollo 17 mission, December 1972

# Appendix D

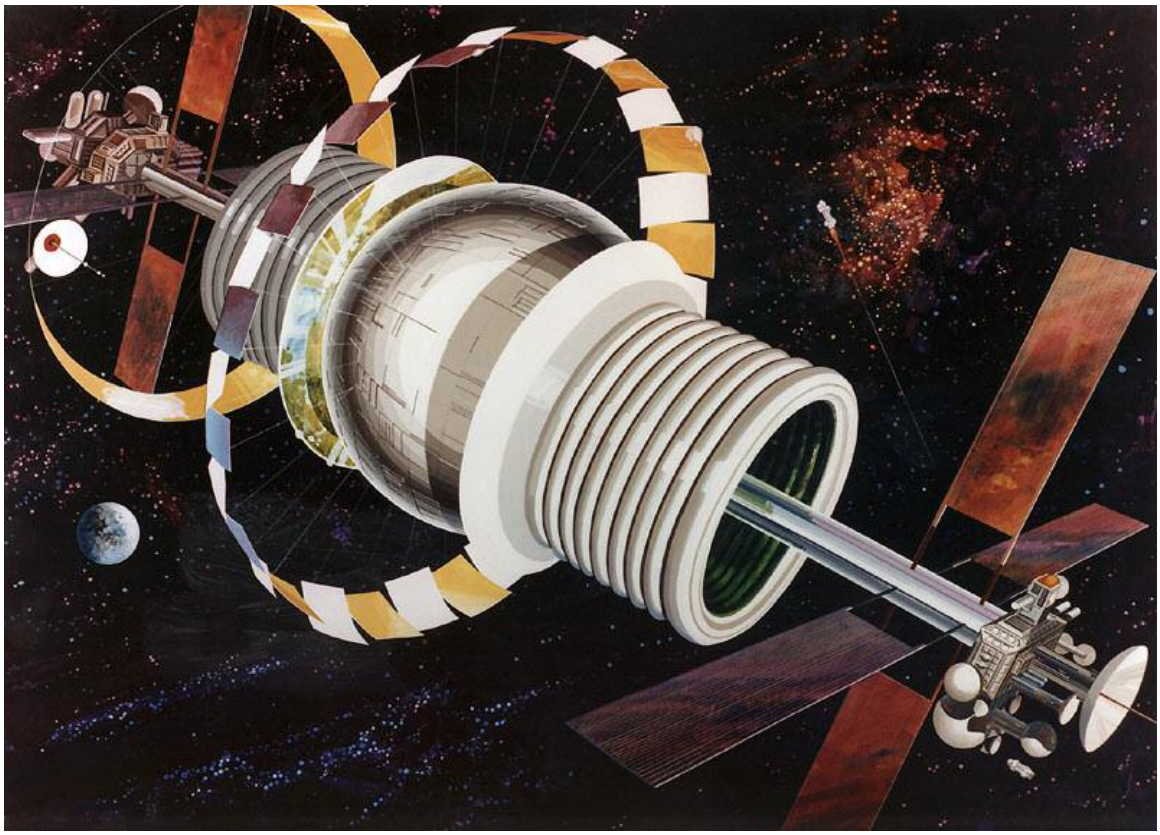

Illustration 4: Gerard O'Neill's Bernal Sphere colony design, exterior view. Painting by Rick Guidice courtesy of NASA.

# Appendix E

Illustration 5: Bernal Sphere interior, complete with cocktail party. Painting by Rick Guidice courtesy of NASA.

# Appendix F

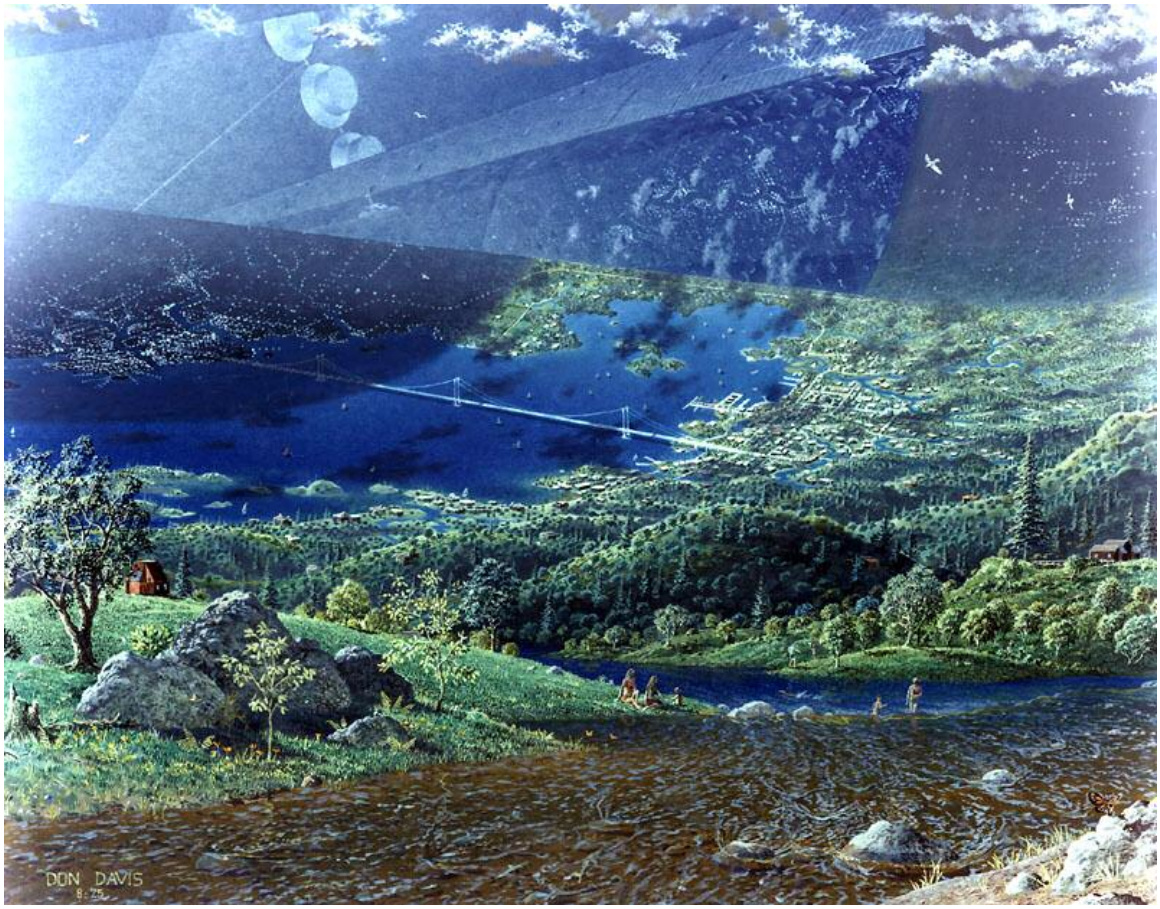


Illustration 6: Don Davis' depiction of the Bay Area reproduced inside a cylindrical space colony.

# Appendix G

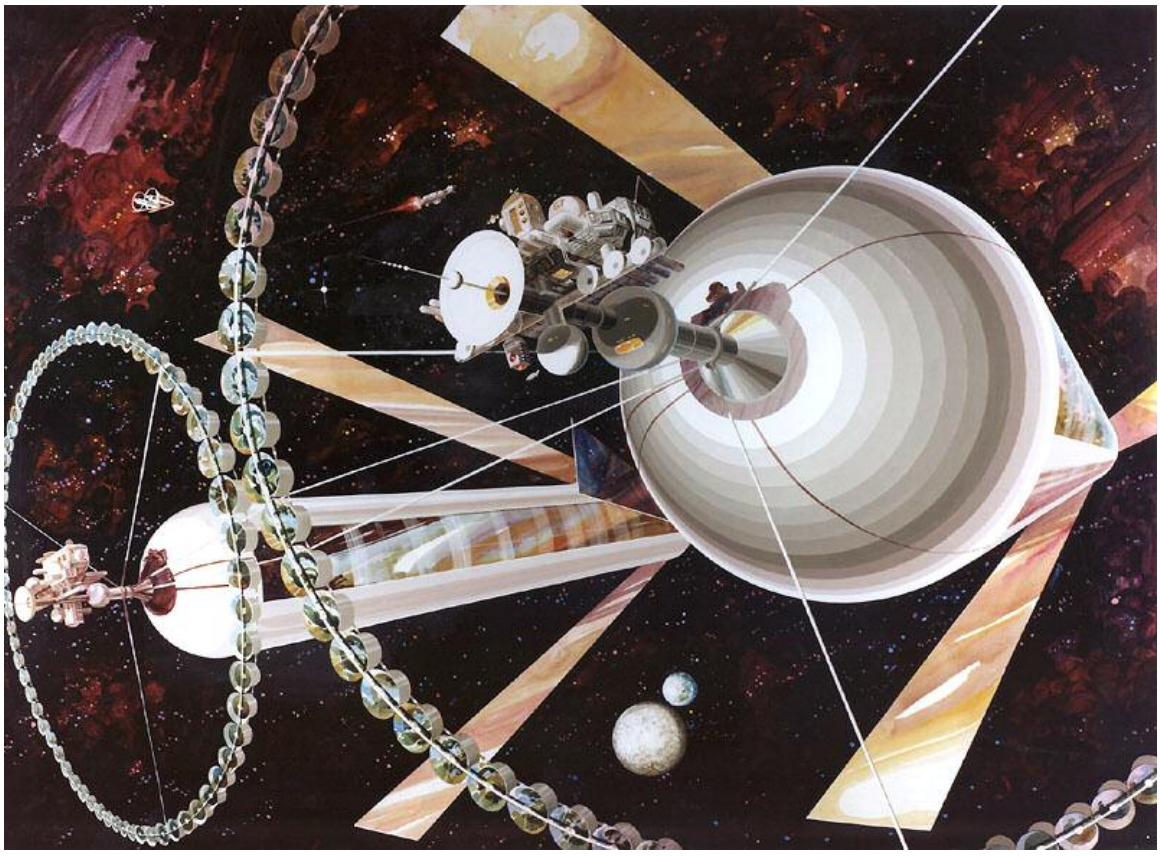

Illustration 7: Exterior of pair of O'Neill space colony cylinders. Painting by Rick Guidice courtesy of NASA.

# Appendix H

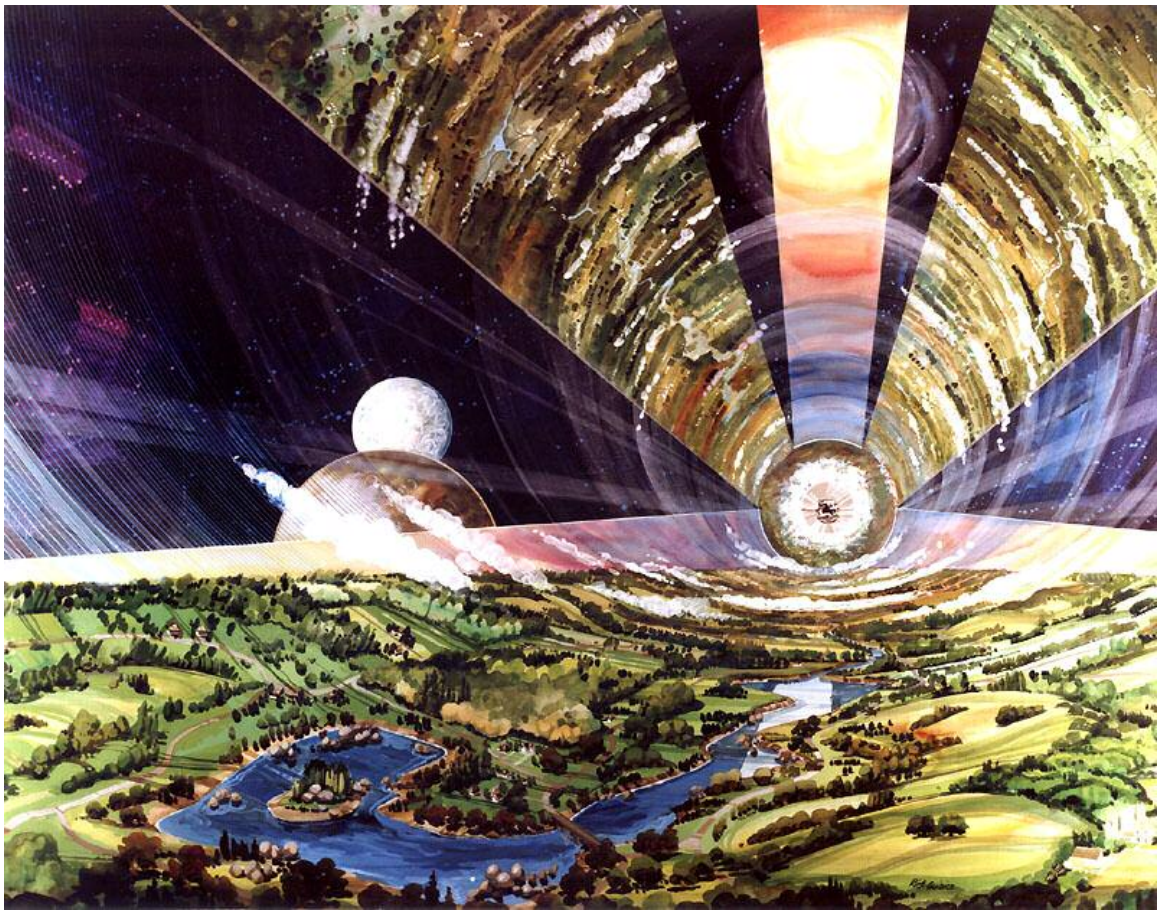

Illustration 8: Cylinder space colony interior. Notice alternating windows and land forms, a layout later dismissed as unworkable. Painting by Rick Guidice courtesy of NASA.

# Appendix I

Illustration 9: Extraterrestrial wilderness in a late model space. Painting by Don Davis courtesy of NASA.

# Appendix J

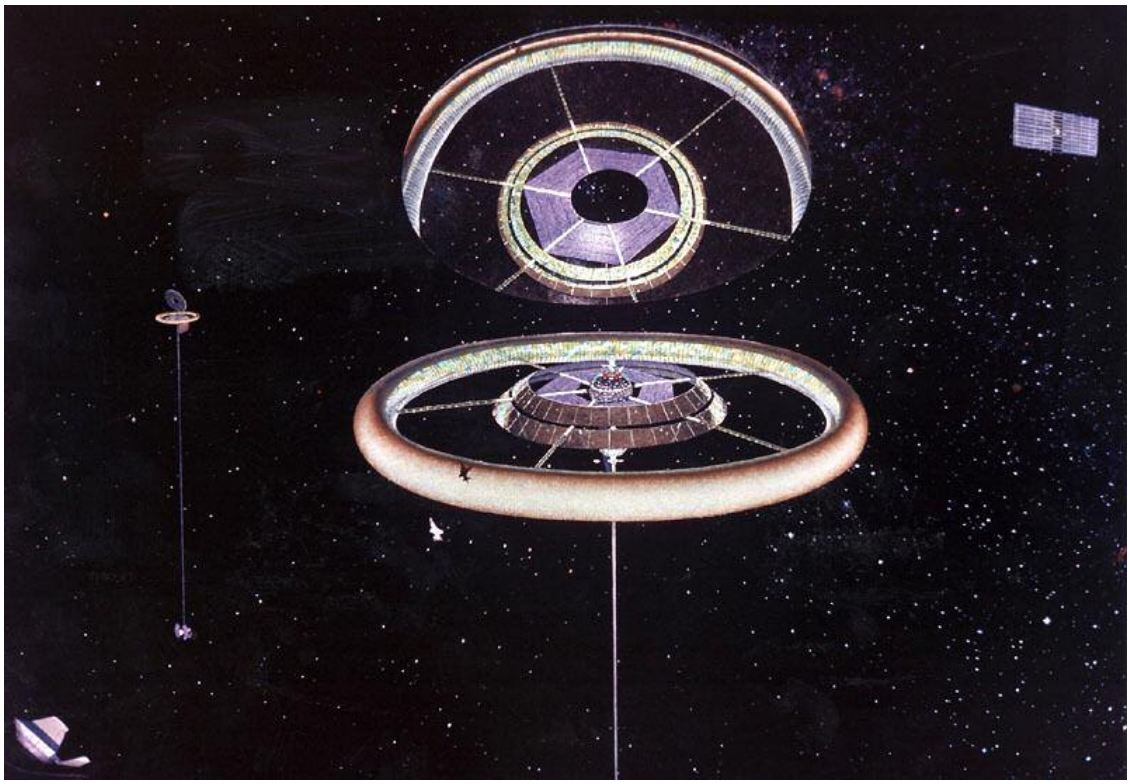

Illustration 10: Stanford Torus as seen from the outside. Painting by Don Davis courtesy of NASA.

# Appendix K

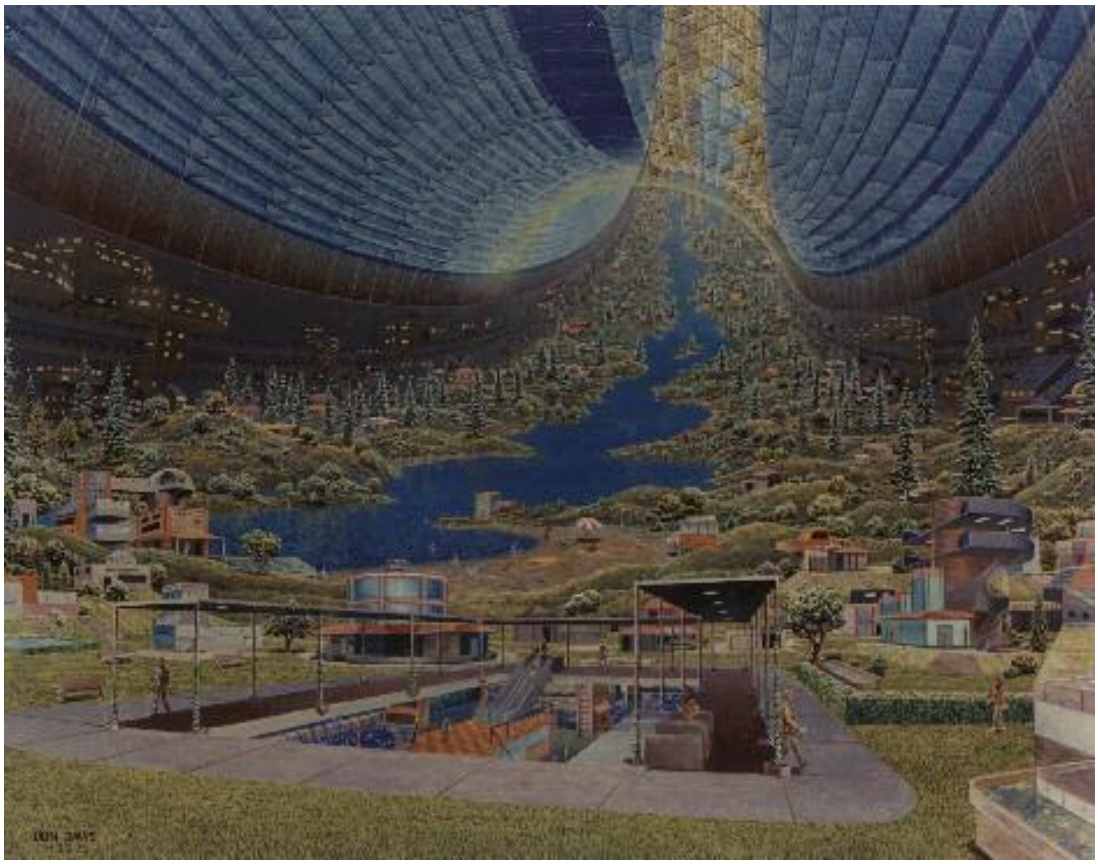

Illustration 11: Mixed wilderness/urban life inside a toroidal space colony as envisaged by Don Davis. Compare with the expansive wilderness of the cylindrical colony previously rendered by Davis.

# Appendix L

Illustration 12: Space city life as envisaged by Michael Preskopf for the 1977 NASA Ames Summer Study.

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# Vita

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